SCIENTIFIC AMERICAN

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THE NEW DOUBLE-DECK-TURRET BATTLESHIP KEARSARGE.

The science of warship design is nothing if it is not progressive, and we are glad to note that the new Kearsarge type of battleship is as great an advance upon the Indiana as the Indiana was upon the existing battleships of any foreign navy.

Whenever a naval board announces a new programme, the publication of the designs is awaited with the deepest interest, for they are expected to embody the results of the very latest experiments in ships, guns, and armor. It is gratifying to note that the bold originality which was shown by our shipbuilders in the early days of the armorclads is repeated in the up-to-date battleships of the new navy.

The designs for that splendid trio, the Indiana, Massachusetts, and Oregon, were a great advance, in their proportion of armament to displacement, upon anything afloat or building at the time of their publication. To flank the 13 inch guns of the main battery with eight 8 inch armor-piercing rifles placed within four heavily plated turrets at an elevation of 26 feet above the water line was a departure from existing ideas as daring as it was novel; and European designers expressed a doubt that the ships could ever carry so heavy an armament successfully. The Indiana has had her trials and justified the confidence of her designers. Indeed, on every point but one she has more than fulfilled expectations. In the gunnery trials, however, it was found that the arc of training of the 8 inch and 6 inch guns would have to be somewhat reduced on account of interference. In official circles this was not altogether unexpected, as the experience of certain European ships had shown that the effect of the blast of the heavy guns extended over a wider area than had been supposed at the time the designs of the Indiana class were drawn up. By reference to the accompanying plans it will be seen that the 8 inch guns were originally intended to fire full ahead or full astern, and also through a considerable arc of training on the opposite beam. To do this latter they had to fire across the top of the 13 inch gun turrets. In the gunnery trials it was found that if the 8 inch guns were laid any nearer to the 13 inch gun turrets than 80 degrees forward of the beam, the effect of the blast was so powerful as to render the sighting hoods of the latter untenable. It was therefore suggested that stops be placed on the turrets to prevent their training any nearer to the axis of the ship than 10 degrees. At the same time the blast of the 13 inch guns, when fired on the maximum train abaft the beam, necessitated the sacrifice of the axial fire of the 6 inch guns, and their ports forward of the beam have been plated in. These modifications are not so serious as they might at first sight appear; for naval engagements will very seldom be carried out in an end-on position; and for broadside firing the whole of the battery of the Indiana is still available. The difficulty of interference was foreseen at the time the plans of the Kearsarge were drawn up, and the way in which it was met reflects the greatest credit upon the designers.

It was decided to dispense with two of the 8 inch turrets altogether, and place the remaining pair upon the main 13 inch turrets, as shown in our illustration. By this arrangement the remaining four guns of the new design were rendered actually more effective than the eight similar guns of the Indiana.

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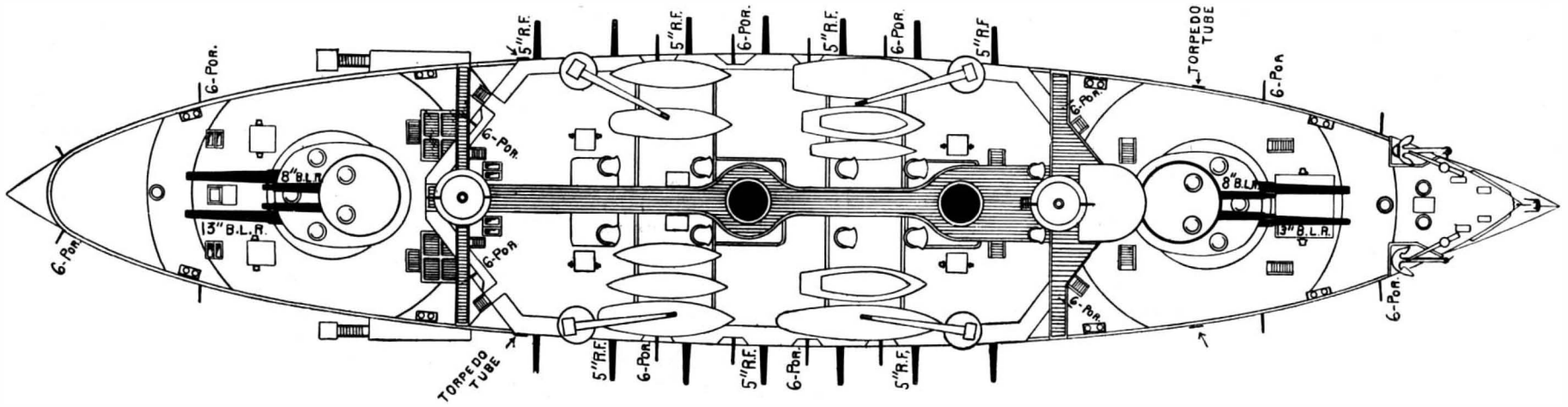
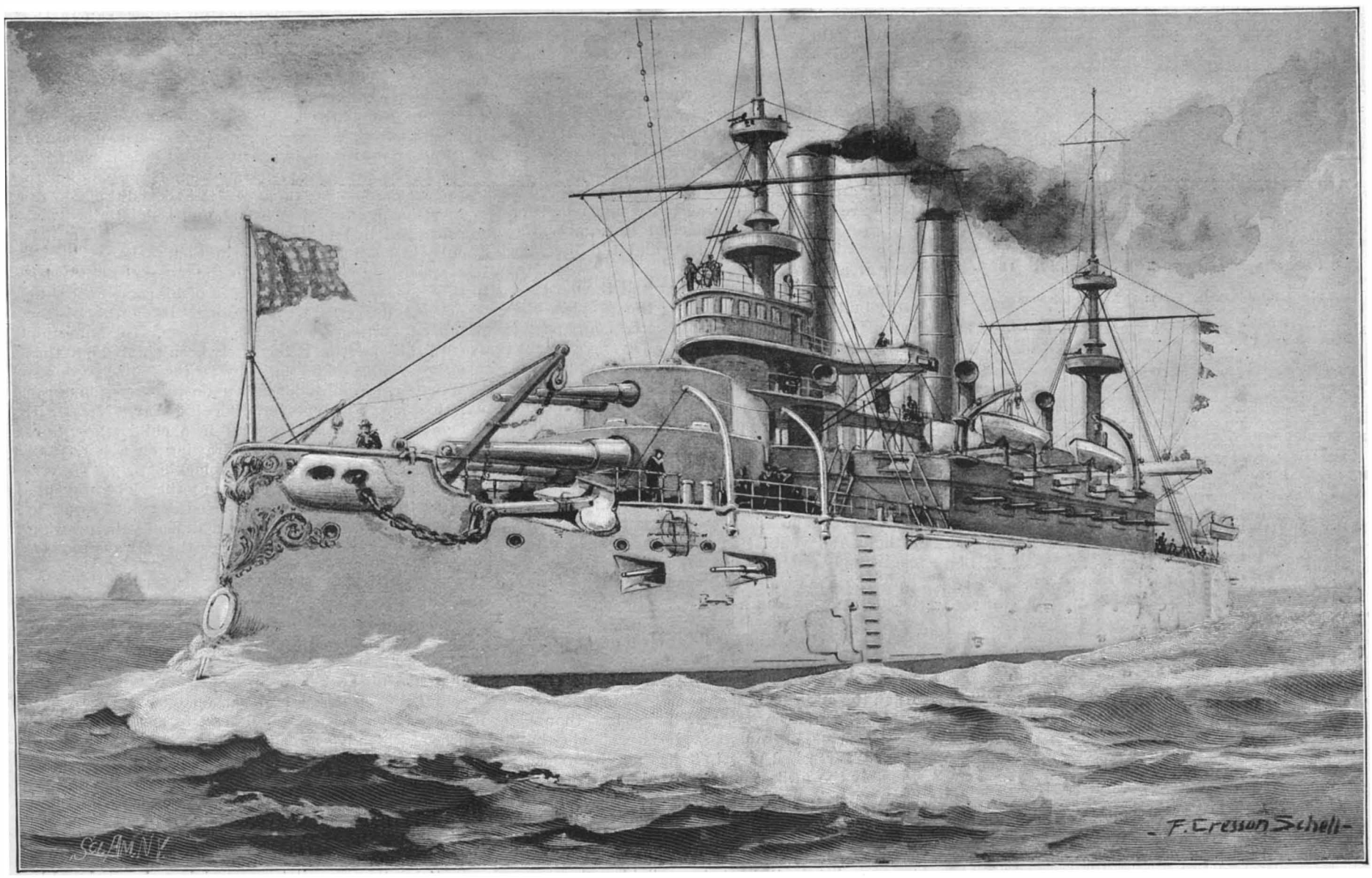


DECK PLAN OF THE KEARSARGE TYPE OF BATTLESHIP.



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THE ELEVATOR PROBLEM IN TALL OFFICE BUILDINGS.

Few manifestations of the capabilities of the modern engineer in this the age of steel are more impressive than the tall office building of our great cities. These structures from their size appeal to the public. Groups of people may often be observed standing on the sidewalks in the vicinity of especially striking examples, looking up at them as at one of the wonders of the day. The same class of building interests the engineer. In them he finds embodied some of the boldest conceptions of his science. The carpenter in erecting a fully framed wooden building first makes a self-sustaining skeleton of beams, and then incloses it by boards. The modern tall office building is of analogous construction. A frame of steel is set up which is self-sustaining, or rather independent, for it is made strong enough to carry hundreds of tons more than its own weight. This frame is open. Its interstices are filled in with brick and stone, material which here departs from its ordinary principal function of sustaining great loads, and whose new office is to act as a screen or a sheathing. The enormous mass of a building of this type may be entirely supported by a few steel columns; the brick and stone could be completely removed from any story without disturbing the floors above it. The entire upper stories, fifteen or twenty in number, could be left standing on a few comparatively slender steel pillars.

The new construction, in its use of cantilevers for distributing weight evenly, and in its rapid methods of construction, has gone far to create the tendency of the day toward great height in buildings. A steel frame is raised with great rapidity. Steel derricks lift an entire truckload of steel beams at a very high speed, and so much of the work has been done and is in process of execution that a new trade, that of housesmith, has been evolved within the last few years. Many new methods or new developments concur to increase rapidity of construction. There is even discernible a sort of rivalry among cities as to which shall have the most impressive tall office building.

The justification of the construction of a tall office building, twenty to twenty-five stories in height, is sought for in the high price of land. It seems a truism that a building twenty stories high gets twice as much out of the land occupied in the way of office area as a building does which is only ten stories high. But such truism does not exist, owing to the necessity for increasing the number of elevators as floors are added, so that twenty floors do not give by any means twice the area of ten floors.

There is one element in the problem of the maintenance of high buildings, one we have just alluded to, of which but little has been said, and which is in very definite need of solution, were such solution possible. It is the elevator problem. One of these great buildings is a concentrated city, and has to be provided with rapid transit for its tenants and for their clients and visitors. Due regard for the comfort of those using the elevators operates to impose a restriction upon their speed.

Already many elevators run so fast as to be very uncomfortable. The high speed is adopted to make each elevator do a better day's work. But in spite of high speed, the elevator service in some cases is proving inadequate. Twenty or more floors, each full of offices, are to be served, and even high speed elevators have to be disadvantageously multiplied for the work to be done. If insufficient in number, they go up crowded with passengers, and the discomfort is very great.

It is the last few stories that tell the most. A ten story building is easily served; the problem becomes serious in one of twenty stories. So many passengers have to be carried to so great an average height that elevators have to be greatly increased in number.

It is here that the trouble begins. It would be very simple to put in a large number of elevators, and the expense of running them could be easily borne, but the room which they occupy is a more serious matter. In the case of buildings of large area, it is easy to surrender to the elevator shafts the less available portions of the building, such as the portion lying in the center. Here offices cannot be placed advantageously for want of light and ventilation. But the tendency to erect exceedingly tall buildings on small areas intensifies the trouble. Practically every portion of the floor space may be of value, and each elevator destroys its own area on as many floors as it goes through.

As the height increases, the number of elevator shafts, penetrating the floors and occupying rentable space, increases, and a balance will eventually be reached when the addition of floors would so magnify the elevator difficulty that more would be lost than gained by the increase in number. It is probable that this balance is reached now if it has not been exceeded. Possibly the utilization for elevators of the least desirable portions of buildings involving the location of elevator shafts near the center of blocks will effect a partial cure. Buildings standing on valuable land of small area have an immense sacrifice to make if elevators are placed within their available office area. In some cases less valuable land near the center of the block might be specially utilized for the elevator system.

Carving Before or After Placed.

It would be interesting to learn just why so many stone carvers prefer to work on the material after it has been built into a structure rather than on the block before placing. When interrogated as to this preference the usual answer is that it is thus easier to match the cutting on adjoining blocks, or that one gets a better idea of the effect in this way. Or perhaps it may be argued that there is danger of damage to delicate reliefs in handling the blocks and getting them into position. Yet neither or all of these appear to be sufficient reasons—sufficient, that is, to offset the disadvantage of working in awkward positions, of not having spare tools handy and of the danger of mutilation of a placed stone by a slip. As to the latter, which would apparently be a very serious and expensive matter usually, one carver, whose specialty is scroll and leaf cutting, medallions, pilaster and column capitals, etc., says that he can generally get over or conceal small breaks by slightly altering the design. But after all the practice does not seem reasonable, and none of the explanations are quite satisfying. Of course there are cases where there is no choice, but for the most part the ornamental work could, it would seem, be done to better advantage in the yard or under cover than when the workman is slung up on a staging. All the delicate reliefs, even in limestone and sandstone, or soft material in general, could be crated and otherwise protected for handling in setting up.

Both systems seem to have been followed by the ancient Egyptian and Greek cutters, though it is not always easy to determine the method. From what is known of the skill of the old constructors in getting heavy material into place, making close joints and perfect matching, it may be concluded that a large part of the carving was done before erection. We degenerate moderns, too, have some tricks of our own, going so far now in good practice as to have pressed and ornamental brick snugly packed in crates at the brick yards, transported in these crates, and finally swung up in them to the level where the brick are to be set, and not for convenience in handling merely, but to avoid chipping of corners and edges, thus effecting quite a little saving. Finished stone also can be protected against rough usage in transportation, as is being done daily everywhere.

It was suggested to an expert carver who favored the plan of working on the building rather than on the unassembled parts of it, that his preference was perhaps only the outcome of convention and habit, and it was delicately intimated that possibly he had not ever considered the matter seriously. But he would not have it that way at all, though he could not make the meddlesome outsider understand why he liked to work lying down or doubled up rather than in the normal posture of other artisans.—Stone.

Children's Inverted Drawings.

The crystalline lens in the eye, like the lens of a camera, causes the image of an object to be inverted upon the retina. Psychologists have yet to explain in detail, however, why we see things right side up, instead of in the inverted position corresponding to the retinal image; though it is believed that the reinversion is effected mentally, and is determined and controlled by sensations of touch. There is no difficulty in accepting this explanation, for every photographer gets so familiar with the inverted positions of things, as seen upon the screen of his camera, that he never thinks there is anything strange about the topsy-turvy picture which he focuses. In connection with this question it has lately been pointed out that many young children draw things upside down. Whether this habit depends upon the inversion of the retinal image is, however, difficult to say. Mrs. D. H. Scott states in Nature that if a child who draws things upside down, when drawing on a horizontal table, is asked to draw on a blackboard placed vertically, he will draw everything the right way up. Thus the explanation of inverted drawings seems to be that some children have a difficulty in drawing upon a horizontal surface things they always see vertically.

Substitute for Diamond for Cutting Glass.

The time honored glazier's diamond seems in danger of being displaced by a cheaper substitute, even more efficient than the original instrument. It is reported that M. Moissan has discovered a means of forming a compound of boron and carbon by heating boracic acid and carbon in an electric furnace, the intense heat of which has already been the means of introducing into every-day use substances that hitherto were either unattainable or too costly. The new substance in appearance is black, something like zoophite; and its hardness is so great as to enable it to cut diamonds with ease. Unlike the results of previous experiments in artificial diamond making, which were in minute particles, the new cutting material can be produced in pieces of any size required.

"Barisal Guns" and "Mist Pouffers."

Travelers in passing through the delta of the Ganges, India, have occasionally heard dull, subdued sounds, not unlike the reverberation of distant artillery. As these sounds have been heard when it was positively known that no artillery practice was being carried out, this mysterious phenomenon, which is known as the "Barisal guns," has given rise to much curiosity and speculation. A similar phenomenon occurs in two different countries in Europe, regarding which, in a letter upon the subject to Prof. G. H. Darwin, M. Van der Broeck, conservator of the Museum of Natural History of Belgium, writes:

"I have constantly noticed these sounds in the plain of Limburg since 1880, and my colleague of the geological survey, M. Rutot, has heard them very frequently along the Belgian coast, where our sailors call them 'mist pouffers' or fog dissipators.

"The keeper of the lighthouse at Ostend has heard these noises for several years past; they are known near Boulogne, and the late M. Houzeau spoke of them to my friend M. Lancaster. More than ten of my personal acquaintances have observed the fact.

"The detonations are dull and distant, and are repeated a dozen times or more at irregular intervals. They are usually heard in the daytime when the sky is clear, and especially toward evening after a very hot day. The noise does not at all resemble artillery, blasting in mines, or the growling of distant thunder."

M. Van der Broeck attributes these noises to "some peculiar discharge of atmospheric electricity." M. Rutot thinks they are "internal to the earth," and might be caused by "the shock which the internal fluid mass might give to the earth's crust."

Similar unexplained noises have been heard among the Dartmoor Hills, England, and in Scotland. Since the publication of Prof. Darwin's letter in Nature last October, there has been a considerable amount of correspondence relative to this unexplained phenomenon, one of the later letters drawing attention to a reference by the late Dean Stanley in his "Sinai and Palestine" to "the mysterious noises which have from time to time been heard on the summit of Jebel Musa, in the neighborhood of Um Shaumer, and in the mountain of Nakus or the Bell, so called from the legend that the sounds proceed from the bells of a convent inclosed within the mountain. In this last instance the sound is supposed to originate in the rush of sound down the mountain side. . . . In the case of Jebel Musa, where it is said that the monks had originally settled on the highest peak, but were by these strange noises driven down to their present seat in the valley, and in the case of Um Shaumer, where it was described to Burckhardt as like the sound of artillery, the precise cause has never been ascertained." The same correspondent, Mr. Edw. Fry, mentions that Burckhardt ("Travels in Syria and the Holy Land," 1822, p. 591) refers to these noises and says "the wind and weather are not believed to have any effect upon the sound."

In the course of a series of "Notes upon the Natural History of New Brunswick," Prof. W. F. Ganong, writing of certain "gun reports" heard upon the southern coasts, says:

"Everybody who has been much upon our Charlotte County coast must remember that upon the still summer days, when the heat hovers upon the ocean, what seem to be gun or even cannon reports are heard at intervals coming from seaward. The residents always say in answer to one's question: 'Indians shooting porpoise off Grand Manan.' This explanation I never believed; the sound of a gun report could not come so far, and, besides, the noise is of too deep and booming a character."

Mr. Samuel W. Kain, secretary of the Natural History Society, of St. John, N. B., has written us that these local noises, and the "Barisal guns" and "mist pouffers," were discussed at a meeting of the society, when "some additional information of interest was elicited. A letter was read from Edward Jack, C. E., stating that he had heard these peculiar sounds on Passamaquoddy Bay years ago. It was also announced that a similar phenomenon occurs in the warm days of summer on the Kennebecasis, a lake-like affluent of the St. John River, of great depth and about seven miles from the city of St. John. This has been observed by several competent observers."

The secretary also read a letter from Captain Bishop, of the schooner Susie Prescott, stating that similar sounds were heard on warm summer days between Grand Manan and Mount Desert Rock.

Referring to the theory that these sounds may be due to geological disturbances, Mr. Kain adds: "It is worthy of note that the land in this region is subsiding at a slow rate, and that two slight earthquake shocks have occurred here lately. These were felt on March 22 and May 16, and were probably due to subsidence."

The attention of the readers of the SCIENTIFIC AMERICAN is drawn to this unexplained phenomenon, with the request that if they know, either personally or by report, of the occurrence of any similar sounds in their localities, they will communicate the facts to us for publication. Such information will be rendered specially interesting, if details as to the frequency of the occurrence of these noises can be given, with any accompanying circumstances which might serve to account for their origin.

Aerial Irrigation.

BY H. M. CHITTENDEN, C.E., U.S.A.

The tract of country extending from central Ohio in a northerly and westerly direction into Michigan and Indiana is perhaps more thoroughly supplied with artificial drainage than any other tract of similar extent in the United States. In topography this region is mostly prairie land, often with no discernible slope, and in its original condition was largely covered with timber. The surface water from rain and snow flowed off with difficulty, and much of it remained on the ground until dried up by the sun. The soil is of a clayey character, but slightly permeable to water, and there are comparatively few permanent springs. Around the sources of many of the larger streams there were formerly extensive marshes, covering thousands of acres, which in their natural state seemed to forbid the possibility of reclamation for industrial uses.

In the course of the settlement of the country the necessity of doing something to ameliorate this untoward condition led to the introduction of an extensive system of drainage. The rich clays of the State furnished a cheap and convenient tile material which became the basis of the system. The tiles were connected with large open ditches, and in some cases, as in the great Scioto swamp, with extensive canals constructed at the expense of the State. Of this entire section of country, it is probable that tile drainage and open ditching overspread forty per cent.

It is not intended here to describe the methods or results of this drainage so far as its original purpose is concerned. Suffice it to say that it has reclaimed many thousands of acres of marshes entirely outside the pale of agricultural use, and has vastly improved the condition of extensive semi-swampy tracts. The purpose of this brief notice is simply to call attention to a secondary though very important result of tile drainage, little enough foreseen by the projectors of the system, since it is of a character quite the reverse of any consideration of drainage. This feature may be described as aerial irrigation, by which it results that the severity of mid-summer droughts in the tile-drained areas is largely mitigated.

To quote from a recent government report,* experience in tile drainage early showed that the tiles produced other beneficial effects than those resulting from the drainage of the land. It was found that tiled land resisted drought better than untiled, and it was constantly noted that along the lines of the tiles there was a freshness of growth that indicated the presence of more moisture than the adjacent ground enjoyed. Tile drainage gradually found its way into areas where no real necessity for drainage existed, and always with advantage to the crops, until now the function of the tiles is by no means exclusively to drain the land, but to secure this beneficial influence, the nature of which is not yet fully understood.

There are several minor contributing causes which produce this result, but the real explanation is to be found in the circulation of the air through the tile and the aeration of the soil in its vicinity. Given a tile drain of known length, size, and gradient, and established data in regard to the specific gravity of air, the deposition of moisture with a fall of temperature, and the difference between surface and subsurface temperatures, it becomes a simple matter to determine the amount of moisture which would be deposited in such a tile under assumed conditions of temperature and humidity. At times it is undoubtedly large, and instances are recorded where an examination of the tiles on hot days has found them dripping with water.

The system of tile drainage which is now being so extensively adopted is thus seen to subserve two distinct, contrary, and important purposes—that of removing promptly the surplus water of spring and that of irrigating the soil during the season of drought. It is not improbable that this method of subirrigation by means of circulating currents of air may furnish a satisfactory solution of the problem involved in recent experiments for the artificial production of rain.

It may be stated that this secondary function of tile drains is now so fully recognized that tracts have been recently underlain with tiles for irrigation purposes alone, and that the results of these special experiments have fully justified expectations.

A DISPATCH from Berlin dated May 28 says that the General Electrical Society announce that an improvement has been made in the Roentgen process, and enables the interior of the head, the larynx and the action of the lungs and heart to be observed on a fluorescent screen. The statement has not, however, been well authenticated.

*Survey of the Miami and Erie Canal, the Ohio Canal, etc. H. R. Ex. Doc., No. 278, 54th Congress, 1st Session, p. 76.

Berlin's Sewage Problem Solved.

Berlin has dealt successfully with the drainage question, says the London Health News. Until about a quarter of a century ago the disposal of sewage was effected in primitive fashion, open drain courses, badly built and with inadequate fall, ran through many of the streets, discharging finally into the river Spree, for whose condition contamination would be far too mild a word. A commission was appointed, which, after visiting various countries, especially England, with the view of practically studying different systems, reported in favor of sewage irrigation on land at a distance from the city. The flatness of the plain on which Berlin is built would not allow of any gravitation scheme, and, consequently, it was found necessary to adopt steam pumping. For the same reason the sewage could not all be collected at one spot, and it was, therefore, decided to divide the city into twelve drainage areas. The ground at the seven sewage farms was well suited for the purpose, consisting only of sandy wastes, then growing only stunted firs and birches, but now converted into fertile fields. The total area of the land which could be devoted to sewage irrigation is 22,500 acres; only about 11,000 acres are at present needed. The following extract is from Dr. Legge's account of these Berlin farms:

"No deleterious effect has been noticed on the health of those living on the sewage farms, and, indeed, at some of them, as at Blankenburg and Malchow, the city has built various hospitals for convalescents, for consumptives, and for women recovering after childbed, and the patients seem to thrive in them as well as they would anywhere else."

The question whether the germs of typhoid fever and cholera pass through the soil into the drainage water has naturally formed a subject of inquiry, but many bacteriological examinations conducted specially with the view of clearing up this point have answered the question in the negative. Until 1892 the laborers working on the sewage farms were remarkably free from typhoid fever, although in 1889 Berlin itself was visited by a severe epidemic; in 1892 a few cases occurred among some farm workers, who were alleged to have drunk largely of the effluent from the farm, but in these instances other possible sources of infection could not be excluded. It is satisfactory to note that, notwithstanding the necessarily enormous cost of working these Berlin sewage farms, the expenses have, in most years, been covered by the sale of the produce, and in one year (1889) the surplus amounted to £11,511.

Balloons in Scientific Observation.

The last number of the Proceedings of the German Geographical Society, says Ciel et Terre, contains a paper by Dr. A. Berson on the use of balloons in geographical explorations. As Dr. Berson has made numerous scientific ascensions, both in free and in captive balloons, his observations are extremely interesting. He notes the importance of captive balloons in Arctic exploration, and regrets that Dr. Nansen abandoned this method of investigation, which he had at first intended to employ. Dr. Berson condemns energetically the project of M. Andree, of trying to reach the pole in a free balloon. He is convinced that this aerial trip, if it should be carried out, will lead to a disaster. In his many ascensions, M. Berson has met with every kind of meteorologic condition, and in all seasons he has found that the temperature at high altitudes decreases more rapidly, or at least quite as rapidly, as at low altitudes, and that at heights exceeding 5,000 meters [16,400 feet] there exist temperatures lower than those deduced from the ascensions of Glaisher. Likewise the increase in the speed of the currents, as one gets higher and higher, is greater than has been supposed. In one ascension, when the velocity of the air was only 11 kilometers [7 miles] an hour between the height of 1,000 meters [3,280 feet] and 3,000 meters [9,840 feet], this velocity attained, between 4,000 and 6,000 meters, to nearly 60 kilometers [37 miles] an hour. A marked preponderance of winds with a westerly component was also proved at great altitudes—a fact which confirms the observations of clouds made from the surface of the earth.

The Beginning of a New Volume.

The present number closes the volume for the first half of the year, and we would urge upon those who are readers but not subscribers of the paper that this is the time to have their names entered on our subscription book and thus make sure of procuring the paper without interruption every week. Those who subscribe now will be entitled to our special number, which will be issued on July 25 and will be an historical review of the progress of inventions during the past fifty years. This number will practically be a volume in itself, and if published in book form would probably cost as much as the subscription price of the paper for a whole year. When remitting for the SCIENTIFIC AMERICAN it would be well not to forget the SUPPLEMENT, published concurrently therewith, and which in conjunction with the parent paper provides a weekly compendium of science of surpassing interest.

Wonderful Things That are Near.

The Philadelphia Press says: "Flying is solved. The principle is known. A mechanical expedient is all that is now needed to make it successful. Practical flight is to-day not more than five or ten years off.

"A glowworm makes light with about one three-hundredth part of the force used in ordinary artificial light. When men know how to make light as cheap, streets and homes will be as light as day for a mere fraction of what light now costs. This is near. Vacuum illumination without incandescence is already in full operation, and in a year or two should cut down the price of light to a sixth of its current cost, and in five or ten years light in a city may be, like water, turned on in every house at will.

"Compressed air has long been known to be the best way, theoretically, to store force for use in transportation. There is no waste and no deterioration. The need is a cheap and efficient motor to apply compressed air to city transportation. If this can be done, first the trolley poles and wires will come down, next the horseless, air-compressed motor carriage will do all the work of city delivery.

"When these changes come the only use for gas will be for cooking—if this is not done by electricity. Factories, also, before many years, will be run by transmitted electric power. This has begun to be done and in five or ten years will be completed, and the factory fire and boiler will be a thing of the past.

"The city of the future, and no very distant future, will have no trolley poles or wires and no horses. All movements will be on rails by silent air motors or by horseless carriages equally silent. All pavements will be asphalt. Unlimited light will be as cheap as unlimited water is to-day. No coal will be delivered at private houses and no ashes taken from them. With no horses, no coal and no ashes, street dust and dirt will be reduced to a minimum. With no factory fires and no kitchen or furnace fires, the air will be as pure in the city as in the country. Trees will have a chance. Houses will be warmed and lighted as easily and cheaply as they are now supplied with water.

"A city will be a pretty nice place to live in when the first twenty years of the twentieth century are passed."

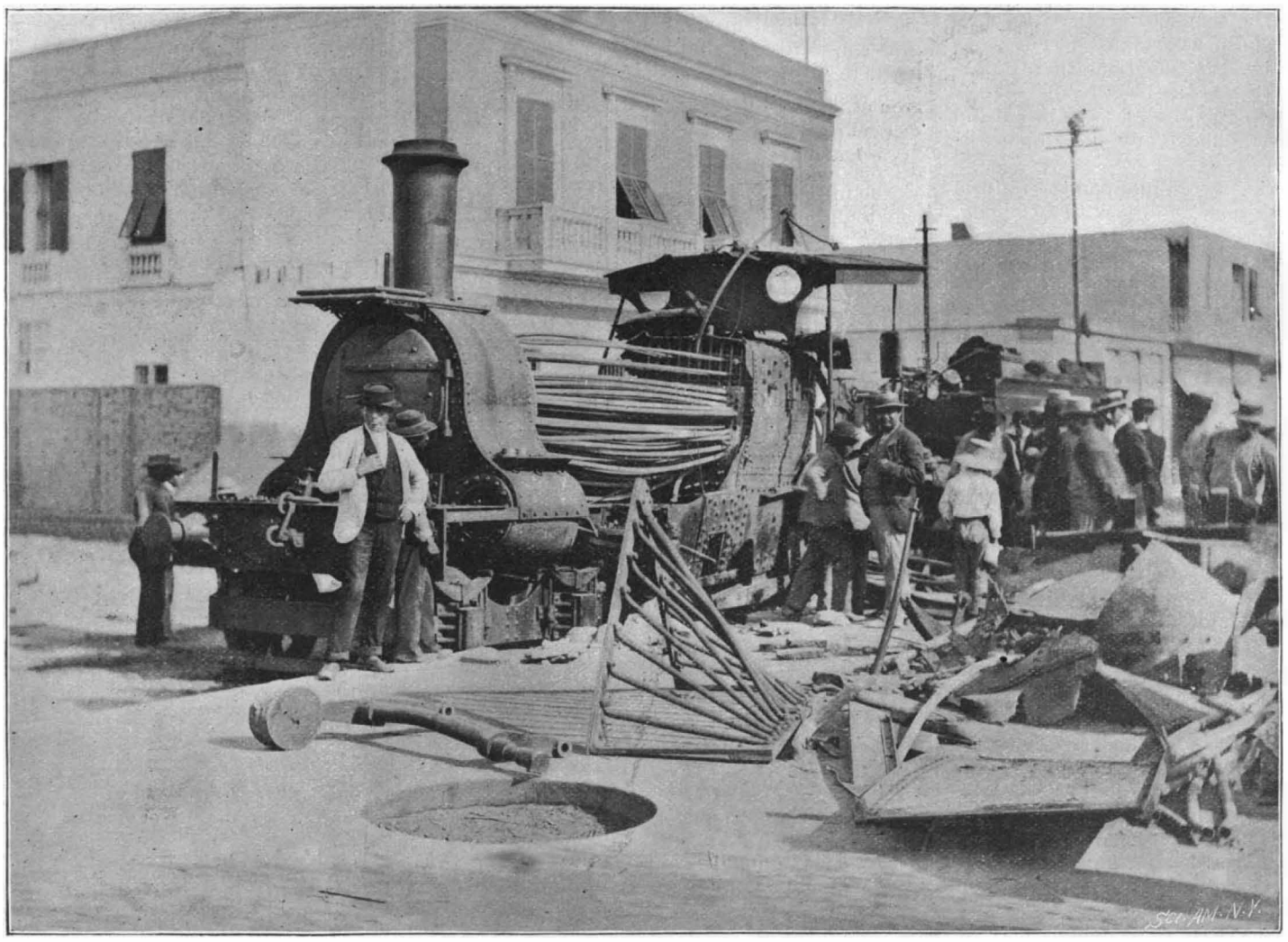
CURIOUS LOCOMOTIVE EXPLOSION IN PERU.

To the Editor of the SCIENTIFIC AMERICAN:

Thinking it may interest some of the readers of your paper, I inclose you a photograph of a locomotive after the explosion of her boiler; an accident which recently took place on the Lima and Chorrillos Railway on April 8. The engine, No. 13, of an up train, with some seven or eight well filled coaches, left Chorrillos at the usual time, apparently in good order, arriving at the station of Barranco ten minutes later, where a crowd of passengers awaited the train. On starting, the boiler burst, with result as shown in photograph. Some pieces of the wreck were thrown to a great distance, and the shock was felt at a distance of three miles. Although this occurred in one of the streets of the town, there were but two or three persons severely injured. Considerable damage was done, however, to the walls and windows of houses in the vicinity of the railway station. The engineer and fireman escaped with a few scalds. The boiler seemed to blow out from underneath, and it is very remarkable that so little damage was done.

The accident was undoubtedly due to low water, high pressure and sudden opening of the throttle on starting the heavy train. J. HOWARD JOHNSTON.

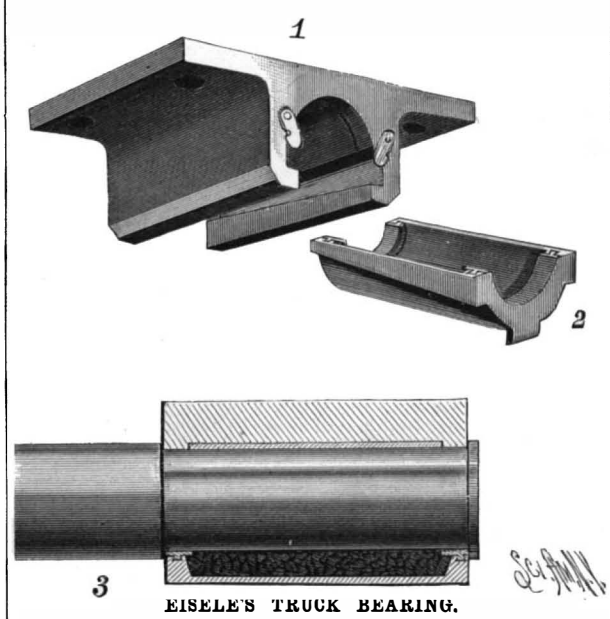
Lima, Peru.



CURIOUS LOCOMOTIVE EXPLOSION IN PERU.

TRUCK BEARING.

The improved truck bearing shown in the accompanying illustration has been patented by Mr. Stephen A. Eisele, of San Antonio, Florida. The bearing is formed in two sections, the upper half of which is bolted to the lower side of the truck, and provided with a semicircular recess, which is filled in with babbitt metal. On each inner side of the upper section near its lower edges are two tapered grooves, which receive suitable tapered ribs formed on the top outer edges of the lower section of the bearing. The lower section is semicylindrical in section and forms an oil cup. The taper of the grooves and ribs is formed on their lower edges, so that, when the lower section is slid inwardly into engagement with the upper section, the upper faces of said ribs will fit snugly against the upper walls of the grooves, thus forming a tight dustproof joint. The cup is held in position by lugs formed on the inner ends of the grooves in the upper section, and by the latches pivoted on the outer face of the same. Semicircular strips of babbitt metal are formed at the ends of the oil cup, and extend inwardly about half an inch, to prevent the oil from spilling over. It is evident that by swinging up the latches the oil cup may be drawn out and refilled without disturbing the upper bearing. It will be filled with some suitable absorbent material. The tight fit which is secured by the wedge action of the tapered ribs in the grooves, coupled with the strips of babbitt metal at the ends of the bearing and cup, provide an effective dustproof bearing.



EISELE'S TRUCK BEARING.

A grand-nephew of Jacquard, the inventor of the loom and the last of the family, has just died at Lyons, where he was a concierge.

How Best to Punish Little Folks.

In a recent number of Science, Professor J. F. Morse, of the Wisconsin University, in Madison, outlined a series of tests which he wants to have parents make with very young children, with a view to finding out the best way to secure respect for authority, and then a report of the result is solicited for comparison with similar statements. The collection of such information may at first seem a little absurd, for every intelligent observer of children knows that the latter differ so greatly in health, brightness, temperament and other qualities that no uniform plan of procedure would give the best results. One child must be managed in one way, and another in another, in order to secure the highest success. Nevertheless, if enough facts could be gathered, it might be possible to classify the little folks who had been examined, so that the best policy for each set could be pointed out. Parents and teachers might find a good summary of these experiments very instructive. A variety of expedients would be suggested, and one could try that which seems to have worked best in cases like those immediately at hand, provided that all others had failed.

Professor Morse suggests that most of these experiments be tried on children whose ages are between two and six. Various offenses are specified, like naughtiness at table, sauciness, taking a playmate's toy, misbehavior while the father has been away from home, and lack of cleanliness; and such punishments are suggested as sending away from the table, shutting up in a room, whipping or spanking, sending to bed without a goodnight kiss. The effect of each is to be carefully recorded. The attempt is to be made, too, to find out whether praise for good behavior goes further than censure for wrongdoing or neglect. And the possible influence of pretending to cry is to be watched. Professor Morse will send instructions to those who are willing to co-operate in this investigation, and asks people to send him their names and addresses for that purpose. He says: "The information secured in response to this request will be used in a general and statistical way without publication of names." Those who participate would be assisting in a cause of great value, and would be doing philanthropic service.

Improvements in the New Photography.

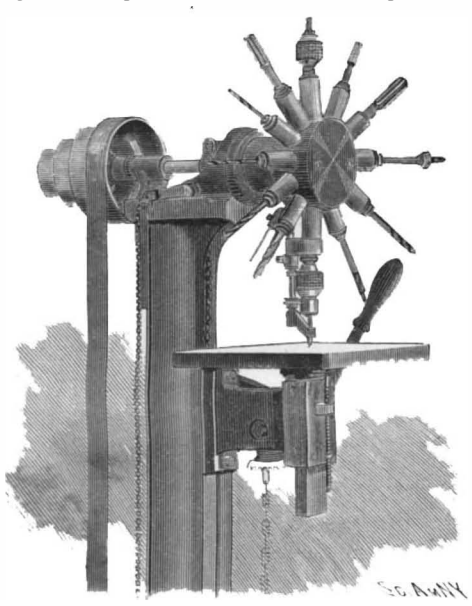
Some sensitized metal plates were submitted to the London Lancet by Mr. Strauss Collin, of Bush Lane House, Cannon Street, E. C. They have since obtained excellent results with these in the Lancet laboratory. They are developed in the ordinary way, using "rodinal" preferably as a developer, and fixed in the hyposulphite bath. Very thorough washing is the next step. The image which first appears on developing vanishes in the hyposulphite solution.

When the plate, after washing, is, however, placed in a solution of perchloride of mercury, the image reappears with great distinctness and with excellent detail. For medical work the employment of these plates offers undoubted advantages. Thus the thin sheeting upon which the sensitized film is spread may be adapted to any shape, and, unlike glass plates, is not easily fractured, so that it may be placed under the body of a patient without risk of breaking. Moreover, as will be gathered from the foregoing description of the process of development, a positive not unlike a ferrotype is at once obtained. The "tones" are good and the plates fairly rapid, the exposure we adopted in the case of the ankle being three minutes.

QUINT'S TURRET DRILL.

The illustration shows a twelve spindle turret drill in which the principle of construction is the same as the well known turret lathe, with the exception that the turret drill works in a vertical position in place of the horizontal. One other important difference is that the cutting tools revolve in place of the work, as is the case with all turret lathes; this allows the finishing of a hole in large or irregular work without moving same, thus assuring accuracy. The spindles are driven from inside turret by bevel gears. Only the spindle in a vertical position revolves, all others are stationary. Any spindle may be thrown into or out of position while machine is running.

The turret drills have the following advantages: Small space occupied for the number of spindles. All

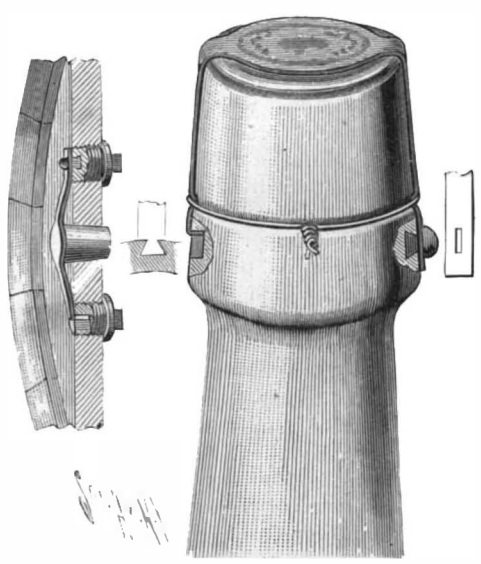


QUINT'S TURRET DRILL.

tools working to same point in center of table. The saving of operator's time in changing tools and moving work. Drilling and tapping at same operation. Small wear of spindles and bearings, as they revolve only when in position for work. The turret drills are built with from two to twelve spindles, as desired, and are specially adapted for drilling, reaming, tapping and hub milling, bicycle, electrical or any light or medium sized machine work. This admirable device is manufactured by A. D. Quint, Hartford, Conn.

SEAL FOR VESSELS CONTAINING LIQUIDS.

The sealing device for the corks of bottles or the bungs of casks shown in the engraving has been patented by Mr. Nicholas C. Patterson, of Junction City, Texas. On opposite sides of the neck of a bottle notches are formed, the opposite walls of the notches being undercut to form locking shoulders for the seal, which consists of a metal strip, of sufficient length to



PATTERSON'S SEAL FOR VESSELS CONTAINING LIQUIDS.

extend over the cork from one notch to the other. One end of the strip is dovetailed so as to securely engage the notch, and the opposite end is perforated with a narrow, longitudinal slot. After the bottle is filled and the cork inserted, the dovetailed end of the strip is inserted in its notch, and the strip is bent down over the cork until the perforation in the other end is opposite the other notch. Molten glass is then run through the perforation and into the notch, and a small bulb is formed on the outside of the strip. When the glass seal is hardened it will be firmly keyed in the notch, and the bulb only connected with the bottle by a narrow neck, where it passes through the perforation. It is evident that this neck will easily break should any attempt be made to slip the strip laterally off the cork, and the fraud would be at once detected. When it is desired to remove the seal and strip, a slight tap on the bulb will break the seal and loosen the strip. To hold the ends of the strip in position while sealing, a groove is formed on the neck of the bottle and a small wire is wrapped around it.

When the device is applied to the bung of a barrel, glass sockets, with undercut walls, are used. These are screwed into the head of the cask from the inside, and are prevented from being pulled through by flanges which bear against the inner surface of the head. The sealing strip is similar to that above described, and is similarly secured. From the description it will be seen that the same bottle or cask cannot be filled twice, as any attempt to pick out the old plug would break a hole through the neck of the bottle.

Nervous Strain of Railway Work.

"There is reason to believe," says the British Medical Journal, "that at all times there are men on the line who are working very near to their breaking strain. We may in regard to this mention three well known instances which, at the least, show the tension under which work is often carried on. A station master, seeing a man run over on the line, himself fell down dead upon the platform. Here was a shock which permanently made his heart stand still; but how many times had not that man's heart stood still before? We may feel perfectly certain that if the major shock could kill, the minor daily recurring shocks of a railway life must have greatly damaged a heart so under the influence of the nervous system. Two trains collided at a function. It was either the fault of the drivers or of the rails, certainly not of the signal man. The signals were right; yet when the box was entered the signal man was found to have gone mad, and had to be taken to an asylum, where he remained for long. He was broken utterly by the horror of the dilemma; but what shall we say about the smaller dilemmas which every hour of his working life he had had to solve? Did they not also have an effect, although a lesser one, upon his brain? A few years ago it was found that the sickness rate among the signal men of certain lines was becoming excessive, and it was determined to do away with the system of leaving to one man the whole responsibility of taking charge of a signal box. At great expense every box along the line was supplied with two men. Great evils were prophesied; it was thought the men would talk, and lark, and neglect their duties. This did not happen, but the sickness stopped. Under the shared responsibility they no longer broke down. If then, as seems to be indubitable, railway 'strain' can have definitely injurious effects upon the nervous system, it becomes an important question for inquiry whether this nervous derangement at all frequently has the effect of impairing the nutrition of the heart. Upon this special point we do not at present possess sufficient information to warrant the expression of a definite opinion."

Reasons for the Siberian Railway.

Siberia is a Russian Canada, larger and more populous, and, like Canada, it has a great future before it, says the Fortnightly Review. It is very rich in gold, while there are whole hills of graphite (black lead) and lapis lazuli; coal can be picked up on the very road near Nerchinsk, there is silver in the same district, and there are rich mines of iron near Nikolaefsk. Siberia, like Canada, is rich in fish. On the Amur River I was told that 200,000 puds of the kita fish have been caught within a few weeks in August, when the fish ascend the rivers; the pud (pood) being 40 pounds, that means 8,000,000 pounds of fish. In the Khabarofka Museum is a stuffed kaluga fish weighing 30 puds, or 1,200 pounds, caught in the Amur. The Russians have been struck by the fact that "the prosperity of Canada and its productive activity have grown, and continue to grow, with a rapidity which appears to us (Russians) miraculous, and by us inimitable, just from the date of the completion of the Canadian Pacific Railway from the Pacific to the Atlantic Ocean."

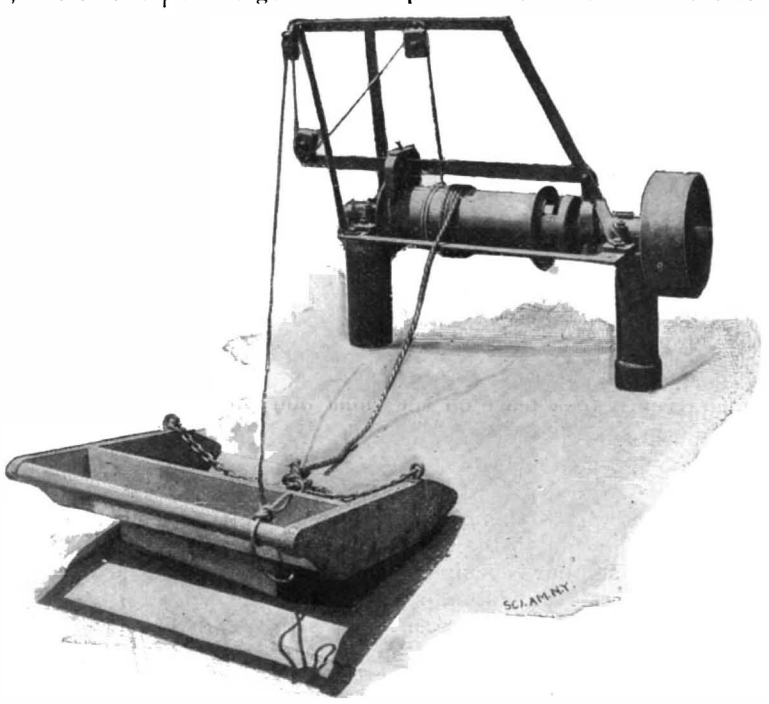
In 1889 they deputed two engineers to observe the Canadian line and its conditions and results. Attention in Russia was drawn to the facts that Canada, a country then of 4,000,000 people, had, by its own resources, without any pecuniary help from outside, connected the two oceans by an iron road 4,500 versts (3,000 miles) long, over very difficult and expensive ground for building, in the short time of four years; that the energetic population of Canada, 3,600,000 in 1871, and only increased to 4,300,000 in 1881, reached 5,000,000 a year or two after the first through train passed Winnipeg in 1886; that the quantity of grain carried in Canada had increased from 303,571 tons in 1886 to 500,000 tons in 1888; that in places without population there had arisen seven new towns, such as Vancouver, founded only in 1886, and holding 9,000 inhabitants in 1891. It was made known to Russia that "the cost of the Siberian Railway should not be even 65 per cent of the cost of the Canadian Pacific."

Coffee as a Disinfectant.

"A year ago, a Russian bacteriologist made some experiments for the purpose of determining the influence of coffee in destroying disease germs," says Modern Medicine. "The conclusion was that coffee is to some degree a disinfectant. The disinfectant properties of coffee depend, however, not upon the active principle of coffee, or caffein, which it contains, but upon the substances developed in the roasting of the coffee. It was found that the various substitutes for coffee are also germicides, and, like it, develop disinfectant properties during the roasting process. A watery infusion of either coffee or its substitutes was found to be capable of killing the germs of cholera within a few hours, and of typhoid fever in a somewhat longer time. The conclusion should not, however, be drawn from these statements that either coffee or its substitutes are to be considered of value on account of their slight antiseptic properties, as too long a time is required for the destruction of germs by them."

GRAIN SHOVEL FOR UNLOADING CARS.

The accompanying illustration shows the general features of a device for saving time and labor in unloading grain cars, or in shifting grain within a warehouse, for which a patent has been granted to Mr. Edwin C. Harnden, of Carbondale, Pa. To the bale of the scoop or shovel is secured a pulling rope, which is arranged to wind upon a loose drum which revolves



GRAIN SHOVEL FOR UNLOADING CARS.

upon a shaft suitably journaled in a convenient position within the warehouse. The shaft is driven by means of a pulley and belting from the machinery of the warehouse and it is provided with a shifting clutch which is controlled by a spring which holds it in its normal position clear of the drum.

The clutch is operated by a shifting lever, which is pivoted on a wrought iron frame, carried above the journals, to which said frame is bolted. At the end of the long horizontal arm of the lever is a pulley, and two more pulleys are provided above the arm on the top bar of the frame. A controlling rope is attached to the drum, and after passing over the pulleys, as shown in the engraving, it is carried to the handle bar of the shovel. In operation the shovel is drawn back to the desired position on the grain heap, and on pulling the controlling cord the lever arm is raised, thereby throwing the clutch, which is keyed loosely upon the shaft, into gear with the drum. This winds up the rope, which is attached to the bale of the scoop, and drags it forward to the edge of the car, or to the desired position on the warehouse floor.

A Demand for Better Motors.

The Metropolitan Traction Company of this city have been experimenting with the underground trolley to take the place of the cable, which is now employed. President Vreeland has this to say regarding the result:

"We are willing to try any motor that promises to be of any value or to change to any form of propulsion that will give better results than the cable. Probably the most satisfactory motor at present is the overhead trolley, but we are not permitted to use that. We have tried experiments with the underground trolley, but find that it is in many ways unsatisfactory. Just as soon as anybody has a practical compressed air motor—or any other kind for that matter—we want him to bring it to us. But we can't be expected to rush into every hare-brained scheme."

Science Notes.

It is said that the petrified remains of a whale 80 feet in length have been found in the hills north of Lompoc, a few miles back from the sea in Santa Barbara County, California.

Essential oil of garlic has been used to cure consumption by D. Sejournet, of Revin, in the Ardennes. Mixed with two hundred times its weight of sterilized olive oil it was injected under the skin, producing a marked improvement in the sixteen patients on whom it was tried.

A five pound meteorite which fell last April in an orchard near Namur, in Belgium, nearly killing a young man who was digging there, has been examined at the university laboratory at Ghent. It consists of a whitish crystalline paste, containing iron, troilite, olivine, bronzite, etc.

A method of mummifying the dead by absorption of humidity and gases after the body is placed in the coffin has been devised by an Italian named Vercelloni. The body seems to be preserved as if in life, except that the color is the yellowish copper tint peculiar to Egyptian mummies.

Dr. P. L. Phipson has found in some Norwegian granite nearly two per cent of mixed oxides of the rare metals; cerium, yttrium, lanthanum, thorium, zirconium, and didymium were discovered. It is very probable that this discovery will be of commercial importance to the incandescent gas light industry.

It has been pointed out that the moist leather of street car straps is a peculiarly fertile medium for the conveyance and propagation of infectious diseases. It has been suggested that as a sanitary measure the straps should be furnished with handles of brass, which should be washed with a disinfecting solution every day. In this manner some of the danger would be abrogated.

Dr. J. Forster, of Amsterdam, has prepared the following table as the result of a large number of experiments on the time and temperature required to destroy the micro-organisms of milk:

131° F. for 4 hours.	176° F. for 5 minutes.
140° F. for 1 hour.	194° F. for 2 minutes.
149° F. for 15 minutes.	203° F. for 1 minute.
158° F. for 10 minutes.	

The survey of the volcano Popocatepetl, for the purpose of determining the best location for an aerial cable railway to the summit, has just been completed, says The Engineer. It has been determined to start the line from the ranch of Tlamacus, and it will be connected with the Interoceanic Railroad at the base, so that the business of shipping sulphur can be cheaply accomplished. This new railway will be a great attraction to tourists, who will now be able to make the ascent to the summit, 18,000 feet above the sea, and also descend to the crater, where the process of extracting sulphur is being carried on.

Dr. Robert Hutchinson, referring in the British Medical Journal to the recent claims by Baumann, Fraenkel, and Drechsel, that they have discovered the active ingredient of the thyroid gland, states that he has found the activity to reside in the proteids of the gland. These proteids are practically only two in number, a nucleo-albumen and the colloid matter, and the latter is the only one that is active. It has been isolated in a state of purity, and is described as containing a considerable quantity of iodine in organic combination. Dr. Hutchinson has succeeded in splitting off from it a body apparently identical with that obtained by Baumann from the entire gland.

Directions for preparing barium platinocyanid, the original fluorescent substance used in Salvioni's skiascope and similar devices for directly viewing Roentgen shadow pictures, are thus given in the National Druggist: "It can be obtained, no doubt, of any chemical works, on application, but as to its cost we have no information. It can be prepared very easily by proceeding as follows: Add three parts of barium carbonate, in finest subdivision, and two parts of platinum chlorid, to ten parts of distilled water. Put on a water bath and heat. When the boiling point is nearly reached add hydrocyanic acid, a little at a time, until the cessation of bubbles shows that carbonic acid and oxygen are no longer given off. The resulting barium platinocyanid, after crystallization, answers to the following formula: $Pt(CN)_4Ba+_4H_2O$."

M. Raoul Pictet, in some recent experiments, says the Progressive Age, has shown that bodies such as the sulphides of calcium, strontium, lithium and barium cease to phosphoresce at low temperatures, The substance experimented on was reduced to fine powder and placed in a tube. This tube was exposed to the rays of the sun and then carried into a dark room and plunged into a glass vessel containing liquid nitrous oxide at a temperature of —130° to —140° C. No signs of phosphorescence were visible. The same was the case when the tube was plunged in alcohol at —100° C. On lowering the tube down slowly into the cold liquid, the phosphorescence was seen to fade away. M. Pictet has also exposed the tubes to magnesium light when very cold. No signs of phosphorescence made their appearance until the tube had heated up again, when it became visible.

Remarkable Heat Record in Australia.

Some remarkable facts in regard to the heat record of January last in Australia have recently been published in the New York Tribune:

An accurate record of Farenheit readings observed in the shade on a veranda overlooking the Darling River, in New South Wales, in January last, is as follows: On New Year's Day, 112°; on January 2, 107; thence steadily rising to 123 on January 7; falling to 114 on the 10th, only to rise to 124 on the 11th; and then, with some fluctuations as low as 117, but not lower, scoring 128 on the 15th and 16th, and 129 on the 18th. Such temperatures in the shade seem incredible. But the record is true. From January 1 to January 19 the range of heat was from 107—the lowest—to 129° in the shade. What it was in the sun one hesitates to think. At Adelaide on January 23 the mercury registered in the sun the appalling height of 172°. Nor was there any appreciable relief from the heat at night. For the first three weeks of January at no time in the twenty-four hours did the mercury fall below 100, and in many places 105 was the lowest point recorded.

This "spell of weather" was exceptional, no doubt. Just what caused it is one of the mysteries of nature thus far inscrutable to mortal ken. Theories are plentiful as blackberries, but none of them convincing. Perhaps the most significant scientific fact connected with the case is that in the Southern Hemisphere summer occurs when the earth is nearest to, and winter when it is furthest from, the sun; exactly the reverse of the conditions prevailing in the Northern Hemisphere. We may naturally expect, therefore, to find the extremes of heat and cold more marked there than here, and such is indeed the case. Let us compare, for example, Grafton, in New South Wales, near the coast, with New Orleans. They are about equidistant from the equator, Grafton being in 26° 43′ south and New Orleans in 30° north latitude. The mean temperature of the former is a little cooler than that of the latter—68·5° and 69·8° respectively. The mean summer temperature of Grafton is the cooler—77·1° against 82°—and the mean winter warmer—58·1° against 55·8°. From these figures one would say Grafton has a more temperate climate than New Orleans. But the record of extremes makes a different showing; for the highest reading of the thermometer at Grafton is 118° in the shade, while at New Orleans it is only 94°, and the lowest at Grafton is 20·9° against 31° at New Orleans. The conclusion is, therefore, that while on the average the Southern Hemisphere is fully as temperate as the Northern, and perhaps even more so, it is subject occasionally to far greater extremes of heat and cold.

But whatever the cause of this hot wave of last January, the results of it are scarcely to be described. People died by thousands. Birds dropped dead from the trees. Rabbits and other animals, though hidden in the shadiest recesses of the forests, perished wholesale. Those that survived were dazed and stupefied, so that the wildest and shyest could be anywhere approached and picked up. Even insect life succumbed, and perhaps the most impressive record of all was that furnished from a place called Nyngan, to the effect that "mosquitoes are being killed by the heat." And all this, it must be remembered, was in a so-called temperate zone, in latitude 30° to 35° south, corresponding in situation with South Carolina and Georgia! Surely, in the face of such a record, with the mercury in the nineties we may keep cool and take courage.

Treatment of Smallpox by Exclusion of the Chemical Rays of Daylight.

In September of last year Dr. J. Moir drew attention in our columns to this treatment of smallpox, and we have since received communications on the subject from Dr. Moir, Dr. Finsen, and Dr. Feilberg. Dr. Finsen has recently published an interesting historical account of the red light treatment of smallpox, the scientific basis on which it is founded, and the method of carrying it out. Dr. Feilberg states that he was at first very skeptical as to the influence of red light on smallpox patients, but, nevertheless, tried its effect on several unvaccinated children suffering from smallpox, and was surprised at the favorable course which the disease took. The vesicles did not suppurate, there was no secondary fever, and no permanent pitting resulted. The essential point for the success of this treatment, according to Dr. Feilberg, is that the patients should come under treatment during the early stage of the disease, shortly after the vesicles have appeared. If the seventh day has been reached, suppuration can hardly be avoided. Another important point is that the exclusion of the chemical rays of daylight must be complete and continued until the vesicles have quite dried up. Dr. Moir, while admitting that Dr. Finsen bases his treatment on a scientific basis, and notwithstanding the extreme ability displayed both by him and Dr. Feilberg and the care and fairness shown by them in their papers, is still doubtful as to whether their explanations are correct. He admits that he criticises without experiment, but, though he has not used identical treatment, yet he has given trial to somewhat similar experiments. For instance, he used to employ a solution of collodion and castor oil on the exposed parts to prevent suppuration and pitting, also, for similar reasons, iodine and glycerine solution, the latter particularly apparently meeting Dr. Finsen's chief requirements; but, as the result of these and similar trials, he still believes that the only distinction to be depended on as to the extent of suppuration and pitting is the presence and quality of the successful vaccination.—Lancet.

Electricity Direct from Coal.

Two processes have recently been described by which electricity can be produced direct from combustion of coal, says the Engineering and Mining Journal. One process is that of Dr. W. W. Jacques, of New England, and his process may be briefly stated as consisting in blowing air though a bath of fused caustic soda, having a carbon anode and iron cathode, whereby he obtains a "very large" current, but the voltage "is low." So many details are missing in the published descriptions that it is hardly possible to attempt a discussion of the merits of the discovery.

Another worker in something the same line is Dr. Alfred Coehn, of Germany, who takes as a basis for his work the principle that a method of obtaining electrical energy direct from the oxidation of carbon may reasonably be sought, first, by determining the conditions under which carbon can be attacked in an electrolyte by the aid of an external circuit, and thereby adapting these conditions for the production of a current. His paper is given on the following page.

The Japanese a Quarter of a Century Ago.

"Thirty years ago," says Chauncey Depew, "I was appointed United States minister to Japan. That country had just been opened to the commerce of the world. Its government was a pure feudalism and of the type of the period of Louis XI. The feudal lords had their armies and their castles and the tillers of the soil were little better than slaves. To-day Japan is governed by a constitutional monarchy and a congress of the representatives of the people. It has an enlightened press, railroads, trolley cars, and electric lights. Then its army fought with spears and bows and arrows, and its soldiers were clad in armor. To-day it has the most efficient navies and best trained and most effective armies in the world. It has utilized every advantage in modern warfare, and in its attack upon China demonstrated that upon land and sea the army and navy of Japan are equal to those of the most advanced of the warlike nations of Europe. Japan is a superb illustration of this age of electricity. It took six hundred years for Europe to progress from feudalism to constitutional liberties and parliamentary government, and from armor and lance to the torpedo and the machine gun. Japan has accomplished the same progress in a little over a quarter of a century."

A Novelty in Magnesium Light.

Magnesium for flash or "torch" has been very popular for some time past, but ribbon or wire is very liable to "give out" just when the light is most needed, except when special precautions are taken or arrangements made. But the new method of burning seems to offer a perfect medium of actinic combustion. It consists in the "sandwiching" of magnesium powder between sheets of paper impregnated with potassium chlorate. Magnesium powder is placed between two sheets of paper, which have been pasted over with starch. The whole, when dry, forms one single sheet. Next, each side is covered with a piece of paper impregnated with potassium chlorate, and the whole covered with a further sheet of paper pasted on each side, a thick sheet, almost like cardboard, being thus produced. It may then, when perfectly dry, be cut into lengths and ignited as required. According to the Journal of Chemical Industry, the combination is quite safe and keeps well.—British Journal of Photography.

THE Swiss government has instituted a collective investigation of diphtheria on a national scale, which is to be continued for two years from March 1, 1896 (Med. Rec.) Every case of the disease, whether under the care of a private practitioner or in a hospital, is to be notified to the local sanitary authority, and every week a report is to be sent to the Swiss health office at Berne. Forms for this purpose with addressed wrappers are supplied to each practitioner. In order to insure completeness, and as a measure of justice to the physician, a small fee will be paid by the authorities for each form duly filled and dispatched.

M. MOISSAN is reported to have discovered a substance which is harder than the diamond, in the form of a compound of carbon and boron. It is produced by heating boracic acid and carbon in an electric furnace at a temperature of 5,000°. In appearance the composition is black and looks not unlike graphite.

Notice to Our Readers.

In order to obtain the opinion of the readers of the SCIENTIFIC AMERICAN as to what invention *introduced within the last fifty years* has conferred the greatest benefit upon mankind, we publish the accompanying card, which please cut out and return to the editor. Those who preserve the paper for binding and do not desire to deface their files, or who read this notice at a library, will please answer by postal card. It is desired to get as full a vote as possible. The result of the vote will be published in the *Special 50th Anniversary Number of the* SCIENTIFIC AMERICAN *on July 25.*

Editor of the SCIENTIFIC AMERICAN.

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The Phonendoscope.

This invention, says the English Mechanic, is stated to be due to Profs. Bazzi and Bianchi, and is said to be useful for hearing: 1. The sound of the respiratory organs, of the circulation of the blood, and of the digestive organs in the healthy body as well as in the sick subject. 2. The sounds made by the muscles, joints, and bones. 3. The sounds in the matrix at the time of pregnancy and the noise provoked by the fœtus. 4. The sound of the capillary circulation. 5. The slightest sound produced in any diseased condition of the body; hence it is possible to draw on the body dimensions, the position, or any alteration in the position of the various organs and of the fluids which have gathered in the most important cavities of the body. 6. The sounds in the ear, the eye, the bladder, the stomach, and the intestines. The instrument consists of a circular, flat metal box or tympanum, having on its one surface two apertures for the attachment of the rubber ear tubes, while the other surface is formed by a thin disk which is readily thrown into vibration. The best results are obtained by simply applying this disk to the surface to be examined. By an ingenious contrivance a second disk can be superposed upon this one and a vulcanite rod attached to the former, so that the area of auscultation may be extremely circumscribed. The conduction of the sounds is only slightly diminished by the use of this rod, which thus combines the principle of the solid stethoscope with that of the tympanum. The rod furnished with the instrument is about two inches in length, but it is stated that there are other rods of various lengths to enable the "phonendoscopist" to receive sound vibrations from the natural cavities which communicate with the exterior of the body. Altogether we (Lancet) consider the instrument highly ingenious, carefully and compactly constructed, useful as an aid to auscultation, but yet not likely to entirely supersede the use of the stethoscope. It may also be found useful in class demonstration, since it would be easy by means of branched tubes to enable several persons to listen at the same time.

Measurement of High Temperatures.

The Chemiker Zeitung gives some extracts from a paper on this subject by Herr L. Holborn and Herr W. Wien (Wied. Ann. Phys. Chem.) There are three methods by which high temperatures may be measured. The first uses an air thermometer of refractory material; the second depends on the change in the resistance of a platinum wire with change in temperature; and the third is based on the employment of a thermocouple of difficultly fusible metals. The air thermometer method was valueless until recently, as suitable vessels could not be made. But now they are produced from some refractory clays, and permit of measurements of temperatures up to 1 500° C. (2,732° Fah.) The results are, however, vitiated by the effects of capillarity in the interior of the vessel. The resistance method has some great disadvantages. At high temperatures the absolute resistance generally increases constantly; but the coefficient of the temperature diminishes very irregularly. The presence of free hydrogen also affects the resistance; and the wire must therefore at least be calibrated before and after use. The third or thermopile method has proved the best. The most favorable circuit consists of platinum and an alloy of platinum with 10 per cent of rhodium. The increase in the electromotive force of such an element is exactly proportional to the temperature No substance, except carbon, affects the constancy of the couple; and temperatures up to 1,600° C. (2,912° Fah.) can be measured by it.

Electricity Direct from Carbon.*

BY DR. ALFRED COEHN.

The problem of the direct production of electricity from carbon would find its simplest solution if we could succeed in dissolving carbon in a fluid, just as we do metals. This question is formulated thus by the theory of electrolysis: Can carbon form ions?

In attempting to find an answer to this question, I started from an observation made by Bartoli and Papasogli, that when dilute sulphuric acid was electrolyzed between carbon electrodes, the carbon anode takes part in the electrolytic processes in such a way that, besides oxygen, both carbonic oxide and carbonic acid make their appearance at the anode. I commenced my experiments by varying the important factors, viz., concentration, temperature, and current density, in order to discover whether it was possible to obtain the products of combustion without admixture of oxygen on the anode. I have not succeeded in obtaining carbonic acid or carbonic oxide alone, but a mixture of the two, containing only one per cent of oxygen. In this mixture about 70 per cent was carbonic acid and 30 per cent carbonic oxide.

In these experiments it was observed that at low temperatures a disintegration of the carbon anode took place, small particles of carbon being seen suspended in the acid. At higher temperatures, on the contrary, no such disintegration of the carbon took place, but a distinct coloration of the acid was produced—at first yellow, then later dark red and red brown. If this is a solution of the carbon brought about by the current, the carbon is presumably contained in it, in the form of ions, i. e., in a form capable of being influenced by the directing power of the current. Such a solution must be capable of giving up carbon to the cathode, since carbon does not decompose water. (A series of platinum plates, coated with carbon, was shown, and a dish, such as is used by Classen for quantitative electrolytic analysis, was shown coated inside with a dense layer of carbon.) The solution and precipitation could readily be obtained with different kinds of coal as anode. Ordinary coal ground smooth, and arc lamp carbons, were found specially suitable; the experiment also succeeded with coke.

That the precipitate was really carbon, and not metal derived from impurities in the coal, was shown by treatment with acids. It was not attacked by hydrochloric acid; in hot nitric acid traces were dissolved—as in the calorimetric test for carbon in steel. In the flame, even the densest precipitates completely disappeared immediately. Finally, a direct proof was obtained by oxidizing the precipitated carbon by chromic acid, and absorbing the resulting carbonic acid in alkali. A number of analyses were made, and these always showed, in addition to carbon, a little hydrogen. The residue—reckoned as oxygen—was sufficient to convert the hydrogen found into water. Either, therefore, in addition to the carbon, a solid, conducting carbohydrate was separated, or some kind of crystalline water which adhered strongly to the carbon was produced. The presence of water in the precipitate is indicated by its behavior with concentrated sulphuric acid. If the acid is dropped on the precipitate it is immediately loosened and blackened, reminding one of the behavior of sulphuric acid with a carbohydrate.

It was now of interest to attempt to construct an element whose soluble electrode consisted of carbon. The only question now was to place a more electronegative element opposite the carbon. The peroxides stand still nearer even than carbon to the negative end of the potential series. Lead peroxide was used in the practical form of a charged accumulator plate. If this is placed opposite a carbon in sulphuric acid of the proper concentration, temperature, etc., an element is formed of which carbon is the soluble electrode. The element supplies a strong and constant current. Through an external resistance of 100 ohms it shows an E.M.F. of 1·03 volt.

There arises here the question whether any share in the production of the current is due to the reactions on the carbon, and if so, what share? Platinum also, when placed opposite a peroxide plate under the same conditions, shows a current in the same direction as the carbon. But it never comes to a visible development of oxygen; as soon as the platinum is charged with oxygen, the current becomes exceedingly small. If the carbon was an insoluble electrode, it would behave in the same way. But this is not the case. The current lasts till the accumulator plate is discharged. A second charged peroxide plate may then be substituted, and the current is again produced as strong as before.

The results of my investigation may be summarized as follows:

1. It is possible by electrolysis to produce a solution of carbon.

2. From such a solution, carbon may be separated as a cation.

3. An element may be formed of which carbon is the soluble electrode.

* Angelegenheiten des Elektrotechnischen Vereins; Elekt. tech. Zeit., March 19, 1896, p. 190.—From the Electrical Review.

Dry Plates for Radiography.

At a meeting of the Royal Photographic Society, says the English Mechanic, Mr. H. Snowden Ward read a paper on "Dry Plates for Radiography," in which he gave an account of experiments with seventeen varieties of plates, the duration of the exposures varying from one to four minutes with a two inch to three-inch spark, development being by means of a standard ferrous-oxalate developer at 60° F. With regard to the correspondence between light sensitiveness and X ray sensitiveness, it appeared that plates fairly sensitive to daylight were needed for radiography, but some curious observations were made: for instance, a plate which read about 130 H and D gave immensely better results than plates by the same makers reading 158 and 331. A plate specially prepared for radiography gave a very dense deposit of silver all over, even under a safety strip of copper and lead. Dr. Hesekiel has exposed a dry plate beneath a packet of a dozen sheets of bromide paper, obtaining good images alike on plate and papers, which seemed to suggest that speed would be increased in direct proportion to thickness of coating. Experiments with one make of plate confirmed this idea; but, with a different plate, the result was quite opposite, though this was probably due to an error on the part of the platemaker with regard to the double coating. Soaking the plates in solutions of fluorescent salts tended rather to loss of sensitiveness than to increase of speed, and celluloid apparently had no advantage over glass as a support for the sensitive film. The results of a large series of tests were shown by means of tables of comparative readings, indicating, among other points, that, with a suitable film, increase of thickness was a decided advantage, and that the amount of silver present was an important factor.

A New Elementary Substance.

E. Demarcay publishes evidence in support of a suggestion that a hitherto unknown element exists in the rare earths yielding samarium. From these earths he has obtained a colorless, slightly soluble nitrate, showing only slight traces of the absorption bands of samarium, together with the spectrum of gadolinum, an element discovered by Marignac, and other lines not belonging to that spectrum. The oxide prepared from this nitrate is distinguished by its lack of color, the formation of colorless salts without absorption spectra, and differences between its spectrum and those of the oxides of lanthanum, cerium, gadolinum, ytterbium and terbium, the only ones so far known that form colorless salts. It is further distinguished from lanthanum and cerium oxides by its relatively feeble basicity and the solubility of its double potassium sulphate; from ytterbium oxide it is distinguished by its relatively strong basicity and the slight solubility of its double sulphate; but it strongly resembles the oxides of gadolinum and samarium, the use of the spectroscope being required to distinguish it from them. The new element is provisionally designated as Σ, and its oxide is therefore Σ_2O_3. It is stated that spectrum analysis also indicates the existence of another oxide, but further comment on this point is deferred. Since samarium oxide prepared by Cleve, and supposed by him to be pure, has been found by Demarcay to contain definite traces of terbium and gadolinum oxides, together with a considerable proportion of the newly discovered oxide, it is suggested that the atomic weight ascribed to samarium (150) may probably require to be modified.—Comp. Rend., cxxii, 728.

Effect of "Bicycle Boom" on Trade.

The New York correspondent of the Philadelphia Ledger writes to that paper that "there has been much discussion of late as to the effect on other trades of the big boom in bicycles. The New York Journal of Commerce recently had a long editorial on the subject, and trade papers have generally discussed it. Recently the New York Journal devoted a page to the matter. It estimates the loss to other trades at $112,500,000 a year, and yet it leaves out of its calculation several items that might with reason have been incorporated. It has been generally known that the livery business and the carriage trade had been seriously hurt, but it has lately been made known that the demand for pianos, jewelry, watches and confectionery has fallen off materially. It is stated that less whisky and lager are drunk, fewer cigars smoked and fewer books bought on account of bicycles. The theaters complain that they are obliged to close much earlier in the season because their patrons prefer wheeling to seeing plays. One way of arriving at the financial effect of the bicycle craze on a different basis than that of the Journal is to estimate the year's output of wheels at 1.000,000. As the average cost of wheels is about $75, it follows that $75.000,000 will be expended this year for wheels, and is thus diverted from other lines of trade. What is gain for the bicycle makers, Bradstreet's adds, is a clear loss to other business men."

THE NEW DOUBLE-DECK-TURRET BATTLESHIP KEARSARGE.

(Continued from first page.)

This is evident from a comparison of deck plans of the two types, when it will be seen that the Indiana is incapable of dead ahead or dead astern fire with her 8 inch guns, and that her maximum concentration of fire from the whole eight of them is four on either broadside. The Kearsarge, on the other hand, can not only concentrate an equal number of 8 inch guns on each broadside, but can swing each pair through an unbroken arc of 270 degrees ahead or astern. Experiments recently carried out at Indian Head on an improvised platform showed that there would be no inconvenience experienced in the 13 inch turrets from the blast of the superposed 8 inch guns.

Moreover the turning gear and ammunition hoists of the 8 inch guns on the Kearsarge have an unparalleled protection afforded to them by the 15 inch armor of the turrets and barbettes upon which they stand, whereas the funnel-shaped base of the Indiana's 8 inch turrets is plated with very light armor; and should a shell penetrate and burst within them, it would probably disable the guns altogether. From these considerations we think it is evident that the sacrifice of power in removing four of the 8 inch guns is more apparent than real; and that the disposition of eight guns in two turrets as against twelve guns in six turrets gives the Kearsarge slightly more power for attack and far greater endurance for defense than the earlier type of ship. As originally designed, it was intended that the 8 inch should be rigidly imposed upon the 13 inch turrets. This would necessitate their simultaneous training; but there are no structural reasons why they should not be given an independent motion, and we believe Mr. Irving Scott, of the Union Iron Works, San Francisco, has already put in a bid on a design of this nature.

Not only is nothing lost by the removal of these guns and turrets, but the equivalent weight has been put into a broadside battery of fourteen 5 inch rapid-firing guns, which is protected by a continuous wall of 6 inch Harveyized steel, with 2 inch steel splinter bulkheads worked in between each gun. This battery alone would render the Kearsarge a terrible engine of destruction. Each of the fourteen guns throws eight 50 pound shots per minute, each having a penetration of 13 inches of iron and an energy of 1834 foot tons. In one minute of a sea-fight one side of this battery alone could pour into the enemy fifty-six shots, or nearly 3,000 pounds of steel, at a velocity of 2,300 feet a second, and with a battering or crushing effect of 102,704 foot tons—a force sufficient to lift the ship itself bodily 9 feet in the air. The subjoined table gives a detailed analysis of the total broadside:

Number of Guns.	Diameter in Inches.	Weight in Pounds.	Velocity in Foot-Seconds.	Energy in Foot-Tons.	Total Energy.	Penetration in Inches at Muzzle.	Point of Attack in Enemy.
4	13	1100	2100	33,627	134,508	34·6	Belt and main turrets.
4	8	250	2150	8,011	32,044	21·6	Conning tower and casement armor.
7	5	50	2300	1,834	12,838	13·0	Thin armor, superstructure, and unarmored ends.

In addition to this, there would be a continuous hail of smaller projectiles from the 6 pound and machine guns located on the upper deck and in the fighting tops.

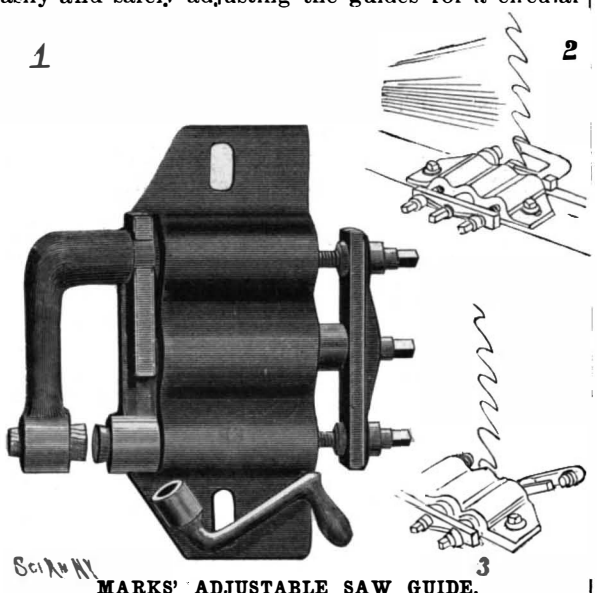
The armor belt, 7½ feet wide, will be 16½ inches thick amidships, tapering toward the bow, and it will be associated with athwartship bulkheads 10 and 12 inches thick. Over this will be placed a 2¾ inch steel deck, and in the wake of the engines and boilers will be a cellulose water-excluding belt backed by many feet of coal. Within the shelter of this inverted box of thick armor, with its cellulose and coal lining, will be located the "vitals," i. e., the engines and boilers.

The main dimensions will be: Length, 368 feet; beam, 72 feet 2½ inches; draught, 23½ feet; displacement, 11,500 tons; horse power, 10,000; speed, 16 knots; normal coal supply, 410 tons; complement, 520 officers and men; cruising radius at 10 knots with 1,210 tons of coal at 25 feet draught, 6,000 knots. The total cost not to exceed $4,000,000.

The unusual height of the smokestacks is in agreement with the latest practice, which tends to make all possible use of natural draught.

AN ADJUSTABLE SAW GUIDE.

The accompanying engraving shows a device for easily and safely adjusting the guides for a circular



MARKS' ADJUSTABLE SAW GUIDE.

saw, for which a patent has been granted to Mr. Alphonso Marks, of McComb, Ohio. It consists of a stout pocket or holder, which is flat on its under surface, and is provided with slotted holes whereby it may be bolted down upon the frame of the circular saw. It is provided with two transverse circular openings, in which the shank portions of the guide jaws are adjustably held. These shanks are hollow and receive two adjusting screws, which are threaded in the ends of the shanks, and are held by means of fixed and loose collars and nuts in a suitable crosshead. This crosshead is provided with a hollow circular portion which is adjustably held in a transverse opening located in the pocket or holder and between the shanks of the guide jaws. The crosshead is adjusted relatively to the pocket by means of a screw. By this arrangement either of the jaws may be adjusted by means of its own screw, to suit the thickness of the saw, or both jaws may be simultaneously adjusted by means of the center screw actuating the crosshead. The two jaws are prevented from rotation by means of projecting arms or lugs, which bear upon the flat base of the holder or pocket. The outer jaw is L shaped, and it is provided at its outer end with a square opening which receives a wooden plug, a similar plug being provided in the opposite jaw, the ends of said plugs being brought up to the saw and serving to guide the same. By this arrangement the plugs can be easily replaced when necessary. The adjustment screws are operated by a suitable key or wrench which may be laid away when the saw is running.

On the Combined Action of Light and Water in the Liberation of the Perfumes of Plants.

It is light, and not oxygen, as it has been assumed, which is the principal cause of the transformation and destruction of odorous substances, but in many cases these two agents seem to act in concert. The action of light makes itself felt in two different manners: on the one hand, it acts as a chemical power, capable of furnishing energy to all the transformations through which the odorous products pass from their elaboration to their total resinification; on the other hand, it exerts a mechanical action which plays an important part in the general life history of plants; and this property explains the mode of the periodical liberation of the perfumes of flowers. The intensity of the perfume of a flower depends on the equilibrium which is established at every hour of the day between the pressure of water in their cellules, which tends to drive outward the perfumes already elaborated contained in the epidermis, and the action of light which combats this turgescence. The whole physiology of perfumed plants flows from this simple notion. It is thus explained why in the countries of the East the flowers are less odoriferous than with us, why the trees, the fruits, even the vegetables, are sometimes filled with odoriferous products more or less resinified. It is also explained why in those countries the vegetation is thorny: the vegetation in those countries has too much light and too little water.—Eugene Mesnard, in Comptes Rendus.

A DESTROYING VACUUM.

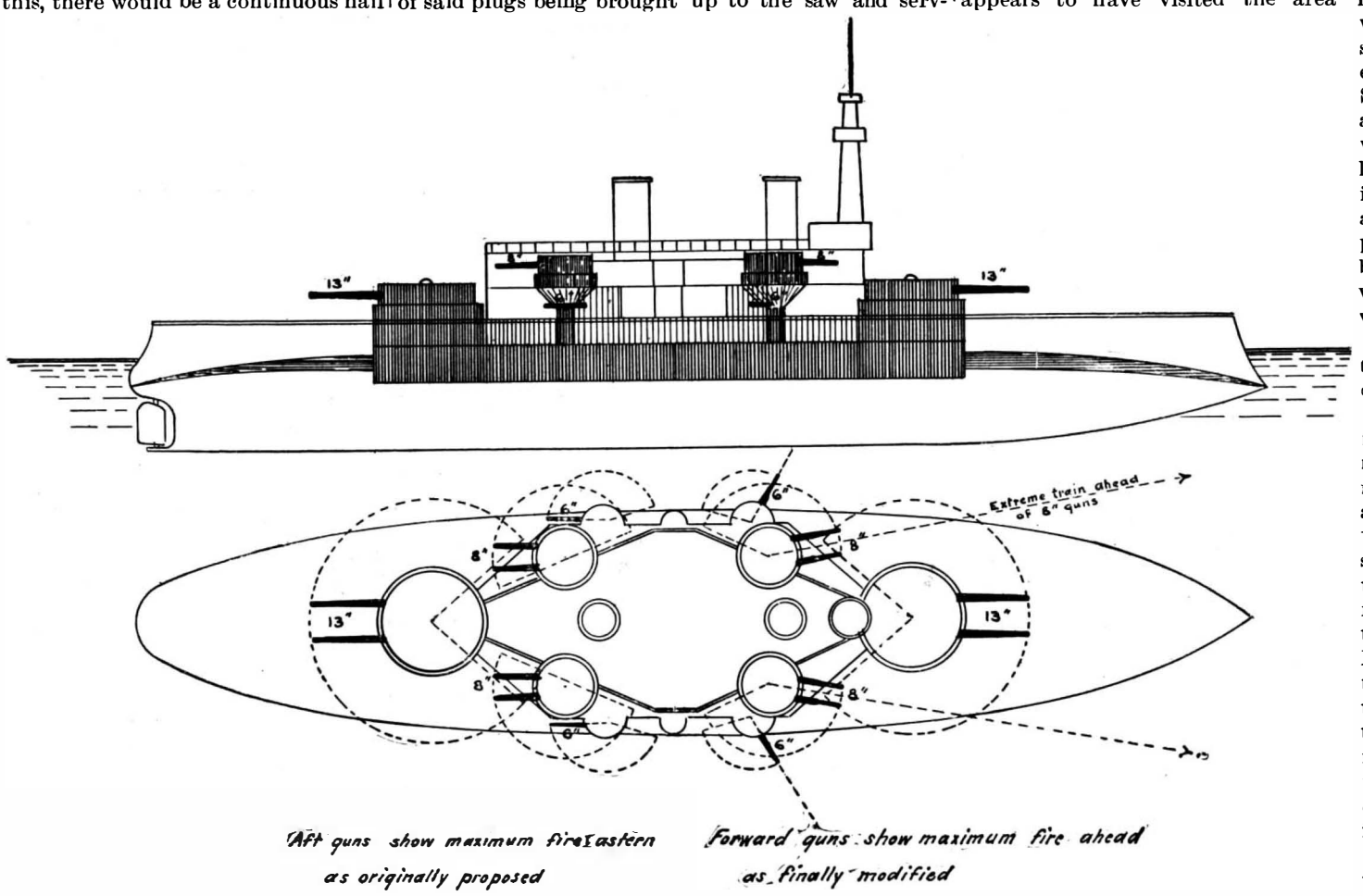
BY JOHN C. BARROWS, M.A., OF ST. LOUIS, MO.

A storm, unprecedented in its destructive and deadly results, which swept through the cities of St. Louis and East St. Louis between 5 and 6 P. M. on May 27, furnished abundant material for th news gatherers who hastened there to the number of several hundred. Both the amateur and professional photographer have been busy about the scenes of greatest havoc. Few, if any, however, have yet begun to study the devastated districts to ascertain and analyze the meteorological phenomena of what most of them have heralded to the world as "a regular Western cyclone," and others, including the local signal service officer, as "a straight blow of wind."

Does the storm's work fit either theory? The results are in many respects unusual, and I believe without recorded precedent. There are abundant indications that over an area half a mile wide and two miles long the destruction was not primarily and chiefly due to the force of a gale or hurricane. Nor does the fact that during the space of a few moments the direction of the wind changed to several and almost opposite points, as is testified to both by numerous eyewitnesses and by many unmistakable results thereof, appear to explain the most serious class of damage wrought to buildings.

I shall not attempt to give a new and scientific explanation of the meteorological phenomenon which appears to have visited the area from a block west of Jefferson Avenue east to Main Street, and about a mile wide, but for lack of an existing term, and for the purpose of this brief paper, will call it a vacuum storm.

To indicate that the conclusion that this in some features was not an ordinary cyclone, and that it was not "a straight blow" that was reached by the orthodox Baconian method, and that the observations were not made to fit a previously conceived theory, it may be well to state that the first object to attract



SIDE VIEW AND DECK PLAN OF THE INDIANA TYPE OF BATTLESHIP.

the attention of the writer as unusual was a small two story brick house, the four walls of which were piled outside of and on their four respective sides of the foundation, the light inside partitions still standing in place, the floors being in fairly good condition and most of the contents of the rooms intact. The roof, a flat one, had been shifted to one side a foot or two, but still covered what was left of the house. The natural question was, In what manner, and how could force be so applied as to blow out the four outside walls of a house, lift the roof a little and then drop it back again, and scarcely disturb the contents of the house, even the silk lamp shade? The only answer seemed to be, the force was exerted from inside.

It then for the first time struck me as strange that most of the broken glass and even the window frames for blocks around were blown out and lying on the sidewalks or in the side yards.

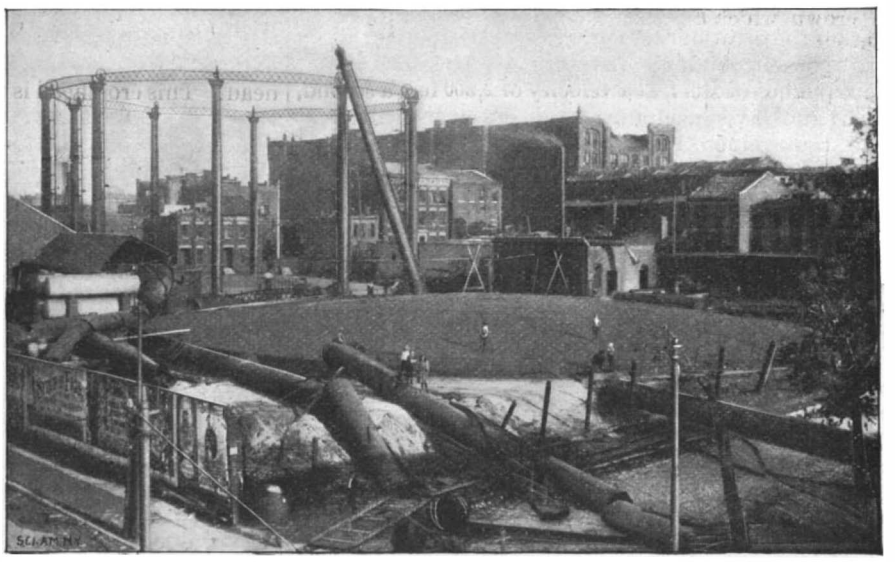
A few hundred feet west stood a house with peaked roof and side walls in place, but with the gable end of the front wall thrown out, from the ceiling of the second story to point of roof, revealing a formerly tight attic. What had exploded in that attic to blow out that brick wall? The windows in lower stories were mostly broken and the glass lying on the outside. Near by was another similar house with gable end of wall intact, but with part of the roof off. Thinking these results might be due to my being in the center of the path of a twister, where a partial vacuum is always created, I went three blocks to one side at right angles to the path of the storm. It was still much the same, the force which had wrecked the buildings seemed to have come from within. A five story massive brick building, used as a trunk factory, had almost its entire south wall piled on the ground beside it, exposing the floors and roof untouched; and, stranger than all, piles of light empty trunks stood on several floors near the missing wall. Only seven had fallen out, the proprietor said, and they fell just outside and did not blow away. Pressure from within had evidently forced out this enormous wall, but once that pressure was relieved, the lightest objects were left undisturbed. If it had been thrown out by wind entering windows from opposite side of building, the piles of trunks would all have been blown out.

DESTRUCTION CAUSED BY LATERAL FORCE OF WIND.

Four or five blocks west, board sheds were standing untouched in a marble yard, while a little further southwest, on Jefferson Avenue near Chouteau Avenue, was a strong brick building used for a furniture storage warehouse whose walls from floor of second story up were all blown out and the roof gone. Here again were piles of light articles—even feather beds left entirely exposed, yet not blown away. Was it true, then, the more openings a building had, the less likely it was to have been destroyed? Observation with this question in mind showed that such was the case, except outside the area before described; there the opposite was true and the damage seemed to have been due to lateral pressure of a gale, the greater damage wrought by wind blowing from each side toward the before mentioned strip, which for convenience we will term the vacuum territory.

It appears that many roofs were lifted and many windows, or, in their absence, walls, forced outward by pressure from within suddenly exerted. Several houses were observed in which the lath and plaster on ceilings of upper floor were torn off in patches, there being no floor to attic, and roofs and walls in place and unbroken. Was this done by the pent-up air of attic forcing an escape? In the vacuum territory roofs without eaves or overhang seem to have fared no better than those which offered such a hold to the wind. In this district there are apparently about as many east walls down as west walls and as many north as south. Some walls fell in and not out, but many of these were forced in by other walls falling against them, others by trees or telegraph poles falling upon them. Some were blown in, it is true, but inquiry of occupants disclosed the fact that in some cases these walls were blown in after the roof had been lifted off and its lateral support removed, or after an adjoining wall had gone out, which, being at right angles, had formerly braced it. A wall left unsupported in this way would naturally fall an easy victim to the terribly severe winds which continued for some minutes. Roofs, too, dragged the upper part of some walls toward the inside of houses. But such cases are clearly

RAILWAY POWER HOUSE AFTER THE STORM.



DESTRUCTION OF GAS TANK AT FOURTEENTH AND GRATIOT STREETS.

HOUSE SHOWING BOTH WALLS BLOWN OUT UPON APPROACH OF THE VACUUM AREA.

FRONT WALLS FORCED OUT BY VACUUM WITHOUT. LAMP LEFT STANDING ON TABLE ON SECOND FLOOR.

CURIOUS EFFECTS OF THE ST. LOUIS STORM.—PHOTOGRAPHS BY B. A. ROBINSON.

the exception, not the rule; and, as before stated, the first in point of time, the primary and most potent energy responsible for the wonderful destruction of buildings in this district, would seem to have been exerted from within outward.

Several newspaper writers have claimed that the twisted trunks of trees in Lafayette Park prove the storm to have been an ordinary cyclone. That there were powerful whirlwinds formed and great numbers of them there is no doubt, but no one who has seen the path of a twister through a forest will liken it to the chaotic condition of the park trees. The axis of a cyclone leaves a narrow and clearly defined trail, which is entirely wanting as regards this storm.

Is it not possible that the atmospheric pressure over an area about a half a mile in circumference and rapidly moving eastward was reduced so largely and so suddenly as to account for it. A reduction of one and a half pounds of atmospheric pressure out of the fifteen pounds to the square inch, if effected instantly, would afford a bursting pressure of two hundred and sixteen pounds to the square foot of internal surface of a roof or wall, provided the inclosed air could not escape. Barometers have recorded such changes in the immediate vicinity of great storms within a very short space of time. May the change not have been almost instantaneous in this case?

The superintendent of the gas works, located on Gratiot Street in the path of the vacuum, when asked to describe what he saw, said that he first noticed the great circular tank "jump up a little way, then bob up and down a little," then the wind struck it, tore apart the great iron girders forming the crown which held together the great boiler iron posts surrounding the tank. These posts fell outward and lay surrounding the tank much like the spokes radiating from the hub of a wheel. As a gas tank is an inverted cup partially filled with gas and floating rim down in a huge cistern of water, it of course rises and falls with changes of atmospheric pressure, like the mercury in a barometer. That the superintendent saw it "bob up" suddenly I can account for in no other way than that the atmosphere was greatly and suddenly rarefied, and had the lower edges of the tank been fastened down, instead of being free to instantly rise through the water, the tank would have burst, just as many strong buildings did.

It would be interesting to note the condition of a self-registering barometer in this vacuum area—if such area there really was—but I have been able to find none. The local office of the weather bureau is a mile to the north. The destruction wrought in what has been termed the vacuum territory can be accounted for upon the theory that atmospheric pressure was here suddenly and violently reduced. The natural laws of pneumatics explain the details. But how could such a large partial void be created? Was there a huge whirlwind at work in the upper strata of the atmosphere which did not, as in the case of previous cyclones, extend downward to the earth? Or are we to look for its cause in the unprecedented splitting asunder and subsequent reuniting of a hurricane?

The path of the storm was widest at the place where the apparent results of a vacuum are noticeable. East of these the path narrows and the direct force of the wind in the direction of the storm's movement was vastly intensified, appearing to have reached its greatest fury about the time it struck East St. Louis. On the east approach of the Eads bridge a pine board was driven through a three-eighths inch iron plate and left sticking there, while equally incredible evidences of the terrific force of the wind in this locality are to be seen on every hand,

If this storm is without precedent let us hope it may remain without parallel. The possibilities for destruction of whole cities by sudden decrease of atmospheric pressure are too appalling to contemplate.

A FLORIDA TREE PALM.

The Oreodoxa regia, or royal palm, is common in Cuba and extends into southern Florida. Our illustration, for which we are indebted to Garden and Forest, represents a young tree of this species near the shores of Bay Biscayne, from a photograph of Mr. James M. Codman, of Brookline, Mass. These trees, according to Prof. Sargent, are often one hundred feet high, with a trunk largest near the middle, but otherwise generally resembling the palms of our southeastern States, and being equally graceful and beautiful. The tree is said to be "the most beautiful of the palms of the United States." It is of an exclusively tropical species, its growth being confined to the shores and keys of the extreme southern part of Florida.

THE ROYAL PALM (OREODOXA REGIA) OF CUBA AND SOUTHERN FLORIDA.

The Oreodoxa, according to Prof. Sargent, is an American genus of about four species. Three are lofty trees, the loftiest, perhaps, of all the American palms, and true princes of the vegetable kingdom, while the fourth is a humble inhabitant of the high slopes of the Andes of Ecuador, only remarkable as one of the most alpine of all palms. The largest species, Oreodoxa oleracea, the cabbage palm of the Antilles, sends up a slender trunk nearly two hundred feet in height, surmounted by a long, green, polished cylinder of petiole sheaths and a crown of long, arching, graceful, pinnate leaves frequently twenty feet long and six feet wide. Its tall, pale stem and beautiful head make this palm a favorite in gardens, and it is planted in all tropical countries and often in long and stately avenues, as in the Botanic Garden of Rio de Janeiro, which owes its fame to its palm avenue. Economically, Oreodoxa oleracea is one of the most useful of the American palms. The bud of young leaves, like that of the palmetto, is eaten as a vegetable; the sheathing bases of the leaf stalks, which are eight or ten feet long, are used by the negroes as cradles, and are split into surgeons' splints; from the inner coat of these sheaths vellumlike paper is made, and mats are manufactured from their fibers. A kind of sago is obtained from the pith of the stem and oil is pressed from the seeds. The long stems are split longitudinally and, freed of the spongy interior, are used as gutters, while from the hard rindlike exterior rim beautiful canes and many small objects are made.

Another genus, Pseudophœnix, is monotypic and confined to two of the southern keys. It is a small and not particularly handsome tree, with long, arching, pinnate leaves and large orange scarlet, usually three lobed, fruits. The flowers of this species, of which there are probably not more than two or three hundred individuals in existence, unless it grows elsewhere than in Florida, are still unknown.

The last of our genera, Thrinax, is exclusively West Indian and Floridian, with a few species of small trees and shrubs distinguished by large, handsome fan-shaped leaves often silvery white on the lower surface, minute flowers, with calyx and corolla confluent into a short cup, and small fleshy or dry fruits. The Florida species are not well known, and there are probably four arborescent species on the keys, although at present no other North American trees are so little known as this group of palms.

THE observations of such a keen observer as Mr. Gladstone are always interesting. An item connected with vegetable physiology has been recently published in a letter by Mr. Gladstone to a correspondent who called his attention to the fact that plants derive most of their nutriment from the atmosphere. Mr. Gladstone, in the course of his remarks, wrote: "Within a hundred yards of my window stood a great beech, now, alas! victim of the gales. Some thirty years ago, an arm, 7 feet or 8 feet from the ground, and about 60 feet long to the end of the twigs, was nearly torn from the branch. I always reckoned that not less than four-fifths of the area which on a clean sawing would have been found to unite it to the tree were torn off; it held on by the remaining one-fifth; but nearly the whole weight of the arm was borne by the ground, on which there lay 12 feet or 15 feet of it, after some stumpy props had disappeared. It never took any sort of root, and the bark remained entire below as well as above. Under these circumstances the leaf came regularly all along the arm for at least twenty-five years, so well that it was not possible to distinguish between it and the tree. I used to look out for signs of failure, but could discern none, and the process might have continued to all appearances without change for a long time."

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By a recent act of Congress the Commissioner of Patents is authorized to furnish inventors, solicitors and others with printed copies of patents at a reduced cost. After July first next, where the number and date of a patent are given, this office will supply printed copies of patents at cost of ten cents each.

RECENTLY PATENTED INVENTIONS.

Mechanical.

CONSTRUCTION OF DRY DOCKS.—Edward S. Walsh, New York City. The invention relates to an improvement in the construction of dry docks and like structures, and the object of the invention is to provide a means whereby the excavating machinery or apparatus may be much more expeditiously and conveniently handled during the progress of the work than heretofore, and consequently lessening the expense and labor in creating such structures. This invention consists in a method of constructing dry docks and similar excavations by the employment of machines necessary for the work and capable of floating, so that the work shall consist, first, in dry excavation, next supplying water to the excavation for the purpose of floating the said machinery, and, finally, erecting a partition at one end of the excavation when completed.

DUMPING WAGON.—Thomas Hill, Jersey City, N. J. The invention relates to dumping wagons and carts, having longitudinally moving or rolling bodies upon the truck portions of the frame. The device is simple and durable in construction and cheap to manufacture. The invention consists principally of a wagon body provided at its under side with eyes forming the fulcrum for the body to tilt the latter on the lower end of the rail or running surface of the side bars of the frame.

WHEEL.—Samuel Carnes, Vienna, Ga. This invention consists of the combination with the hub having annular flanges provided with peripheral spoke sockets, and the tire and felly of the clips having pins entering recesses in the felly and having pins and concentric recesses on their opposite sides, and the spokes entering the hub recesses and there provided with nuts for adjusting them outwardly into engagement with the clip pins and recesses.

ICE VELOCIPEDE.—James Edward Leahan, Boston, Mass. This invention relates to certain improvements in that class of devices commonly termed "ice velocipedes," constructed on the principle of a bicycle and adapted to be propelled over ice or snow, and the object of this improvement is to provide a device of this character of a simple and inexpensive construction which shall be light and strong and provided with means whereby, when the device is used for coasting, the least possible resistance will be offered to its passage over the ice. The invention consists in an ice velocipede having a frame provided with skates or runners, and also provided with a driving wheel adapted to be operated by the feet of the rider, one of the skates or runners being vertically movable, so as to be adapted to be raised or lowered to take the weight of the machine and rider off the driving wheel or to raise said wheel entirely out of operative position.

WINDMILL.—Olef E. Peterson and George L. Curtis, Logan, Utah. This invention is an improvement in the class of windmills having a variable crank, that is to say, a crank which is slidable longitudinally, such movement or adjustment being regulated by the force of the wind on the wheel, so that the work done is automatically graduated to correspond with the power applied. In brief, the invention consists in a windmill of the class specified and in the combination with the casing or rotatable support of the slidable journal box, the wind wheel and its shaft, which is rotatable in and movable longitudinally with such journal box, a crank keyed on the inner end of said shaft, and the pump rod lever which is slidable in its fulcrum and has a universal joint connection with said crank, and means for holding the wheel against the pressure of the wind.

DUMPING WAGON.—Charles E. Plummer, Winchendon, Mass. The invention relates to dumping wagons, and the object of the invention is to so construct a dumping wagon that while the body of the wagon is fulcrumed over the rear axle, a portion of the load will be carried by the forward axle in a four-wheeled vehicle. Another object of the invention is to so hang and mount the body of the vehicle on the running gear thereof that, no matter how heavy the load may be in the body, the body may be carried from carrying to dumping position by the action of the team, thereby dispensing with the services of an attendant or attendants in the dumping operation. Another object of the invention is to so mount the body of the wagon on the running gear that, when the body is dumped, the entire vehicle may be drawn forward and the body carried away from the load. In brief, the improvement consists of the combination with an axle, a reach attached to the axle, and a body mounted to slide over the said axle, of a push bar provided with portions for engaging the body and having sliding and guided movement in the reach, and locking devices adapted to secure the body to the push bar and reach.

AXLE BOX.—William Walker, Mayfield, Pa. The object of the invention is to so construct the box as to prevent water and dirt from gaining access to the oil holder, thereby preventing a waste of oil, since in many mines, where coal is loaded out of water, the water and dirt run into the boxes usually employed and force the oil out from the holder. Another object of the invention is to construct the axle box in such manner that no packing will be required, and so that it will not be necessary to remove any bolts or nuts when changing a bent axle or a broken or worn out wheel, since the box is made in slidably connected sections. In brief, the invention consists of a body section, provided with an axle seat, an oil holder partially embracing the axle and having slidable connection with the said body, lugs projecting from the slide of the oil holder, and stops carried by the body and adapted to be engaged by the said lugs and limit the movement of the oil holder in one direction, whereby the said oil holder will not be separated from the body, and yet may be filled or cleaned.

Electrical.

MAGNETIC MEDICAL APPARATUS.—Augustus B. Slater and Nils A. Renstrom, Omaha, Neb. The invention relates to improvements in magnetic medical apparatus, and the object of the invention is to produce an apparatus which may be made in the form of a couch, sofa, chair, or other article on which a person may sit or lie, and which has a series of electro-magnets arranged in such a manner as to create a magnetic field in which a patient may lie and thus receive the benefit of the electromagnetism without danger of objectionable shock, even though the patient have very delicate sensibilities. A further object of the invention is to produce an apparatus of this kind which is constructed in such a way that the lines of force may be varied at will, so that the electromagnetic influence may be made to exert itself on any part of the patient's body, causing the currents to travel in different directions when desired. It consists of a support for a body and electro-magnets distributed beneath the surface of the support, so as to create a magnetic field.

Agricultural.

BAND CUTTER AND FEEDER.—William McCaleb, Bluff, Ills. This invention is an improvement in that class of band cutters and feeders in which the portion of the apparatus constituting the sheaf or bundle carrier is adapted to be turned up or detached, so that it may be supported on the body or main portion of the frame while the machine is stored or being transported. The feature of novelty is the construction and combination of parts whereby the bundle carrier is adapted to be detached and swung over and held in place on the main portion of the frame.

LAWN MOWER.—Alexander J. Bluntach, Olivia, Minn. The invention relates to an improvement in lawn mowers, and the object of it is to so construct a lawn mower that a reciprocating knife forming a portion of the cutting mechanism may be operated by the manipulation of the handles of the machine, and furthermore, to provide a balance wheel rotated by a reciprocating movement of the handles, the momentum of which balance wheel will be utilized to make uniform and regular the propelling power for the aforesaid knife. In brief, the invention consists in a lawn mower of the combination with a frame, of a fixed and a reciprocating knife, handles pivoted to the said frame, and capable of movement to and from each other, a crank shaft the crank arms of which are connected to the handles, a balance wheel driven by the crank shaft, gearing driven from the crank shaft, and a connection between the said gearing and the reciprocating knife.

CORN HUSKING ATTACHMENT FOR FEED CUTTERS.—George Arthur Stevens, Ringwood, Ill. The object of the invention is to provide a machine in which the cornstalks may be cut into suitable lengths for feed simultaneously with the effecting of the husking of the ears of corn, and to so construct the husking mechanism that but few of the kernels of corn will be separated from the cob, and whereby, further, should any of the kernels of corn become detached during the process of husking, said kernels will be caught and carried to a conveyor together with the husks of corn, thus preventing the loose or shelled corn from being fed to the stock together with the cut feed, since it is more desirable to feed the kernels of corn in a pulverized condition. In brief, the invention consists in a husking machine, of the combination with a substantially smooth roller and of an adjacent roller having flattened peripheral surfaces, and blades longitudinally located upon the said flattened surfaces, the cutting edges of the blades in the revolution of the rollers being made to face the substantially smooth roller.

Miscellaneous.

FOLDING STAND.—William E. Baxter, of Frankfort, Ky. The invention is an improvement in folding stands, and especially in stands for use in and forming parts of camping kits, which may be employed efficiently for supporting a coffee pot, boiler, or cooking utensils on a fire when in use, and when not in use can be folded compactly for a storage. In brief, the invention consists of a folding stand comprising the open frame top, the legs pivoted near their upper ends to said top and foldable into the plane of said top or down to form legs and stopped in both adjustments by abutment with the top frame.

COOKING APPARATUS.—William E. Baxter, Frankfort, Ky. The invention is in the nature of a cooking apparatus for campers, for house use, and for wood, charcoal, gas, oil, etc., wherein are provided an oven and a stove, the stove being formed in detachable sections, and such sections being adapted when separated to be stored within the oven, the oven being also adapted to contain pans, dishes, etc., sufficient to constitute a limited camp kit, the whole being adapted for compact storage, adapting the improvement for pleasure or army camp purposes. In brief, the invention consists of the combination with the oven having an outer casing provided at its open end with inwardly projecting lugs, and the inner casing or shell fitted removably in the outer casing and having at its free end a flange overlapping the open end of the outer casing and having notches or openings for the lugs of the outer shell, the door hinged to the inner shell and the bolt pivoted to said door and turning into engagement with the lugs whereby to hold the door closed, and the inner shell within the outer one.

CLOTHES PIN.—Irvin Y. Baringer, Perkasie, Pa. The invention relates to that class of clothes pins which are adapted to remain permanently on the clothes line; and it has for its object to construct a pin of the character indicated, so that its members will exert a uniform pressure throughout their length. A further object of the invention is to provide such a pin with means for facilitating putting it on the line and removing it therefrom. A still further object of the invention is to provide the pin with an additional means for clamping the clothes pin. The invention consists of a clothes pin, comprising a twin shank, the members of which are a less distance apart than the diameter of the clothes line, and an open or split loop at one end of the shank, one member of the loop being bent over the end of the other member and then down approximately parallel therewith, forming overlapping members between which a line can be passed into the loop.

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Names and Address must accompany all letters or no attention will be paid thereto. This is for our information and not for publication.

References to former articles or answers should give date of paper and page or number of question.

Inquiries not answered in reasonable time should be repeated; correspondents will bear in mind that some answers require not a little research, and, though we endeavor to reply to all either by letter or in this department, each must take his turn.

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(6882) L. S. writes: 1. I wish to make an induction coil capable of throwing a ten inch spark. Please give length and diameter of secondary coil; size of wire for primary and number of layers; size of wire for secondary and number of pounds. What kind of current passes through condenser—static or otherwise? Explain how condenser increases length of secondary spark. Why is primary generally made considerably longer than secondary? A. Our SUPPLEMENT, No. 160, describes a coil capable of giving a 1½ inch spark. A coil of double the linear dimensions of this one, if properly constructed, should give a ten inch spark. Such coils are hard to make and should not be attempted by the amateur. Wind the secondary in six or more sections. There is no such thing as a static current; the condenser becomes charged ("statically" may be applied, but adds nothing to the meaning), and at once discharges, overcoming the prolongation of action due to the extra current, demagnetizing coil and causing more of the energy to go into the spark discharge. The primary is much shorter, as regards feet of wire in it, than is the secondary. If the number of turns in the secondary is divided by the number in the primary and the voltage of the primary circuit is multiplied by the quotient, the result gives the approximate voltage of the secondary circuit. The approximation is apt to be far from close, however.

(6883) W. J. S. writes: Will you kindly tell me how I can make the cells of battery to use to light a one or two candle power electric lamp for a bicycle headlight? A. A small bicarbonate plunge battery is probably as good for your purposes as any. Use very perfectly amalgamated zincs and have it so that they can be withdrawn from the solution when not in use. The carbons you may have very thin, to save room. You will need three couples for one candle power.

(6884) F. M. asks where to procure a description of all the different automatic circuit breakers that are now on the market. Also, please tell me what is the best practical insulator, that is, will stand the greatest amount of heat. A. You will have to apply to the different dealers in electrical supplies for such information. Porcelain represents about the best insulator under the limitations of your query.

(6885) E. J. M. asks: 1. What is meant by saying that galvanic batteries are connected in series and in parallel, and what are these different modes of connection used for? A. The SCIENTIFIC AMERICAN, vol. 61, No. 15, and our SUPPLEMENT, No. 792, describe different ways of connecting battery cells. 2. What is an earth battery? A. Our SUPPLEMENT, No. 157, among other batteries, describes this. It is of little value. 3. In the SCIENTIFIC AMERICAN of August 9, 1879, page 91, communication (10) H. W. F., describes a cheap battery. Does this battery soon polarize? What is it used for? A. The battery is for closed circuit work. It will polarize rather early, owing to small quantity of solution. 4. Have you a number of the SCIENTIFIC AMERICAN SUPPLEMENT describing the making of the different kinds of galvanic batteries? If so, will you please send it to me? A. We refer you to our SUPPLEMENT, Nos. 157, 158, 159, and 792, for illustrations and descriptions of numerous forms of batteries.

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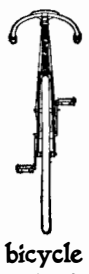

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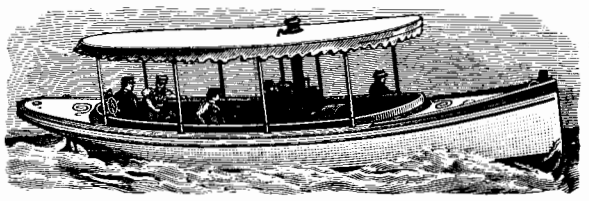

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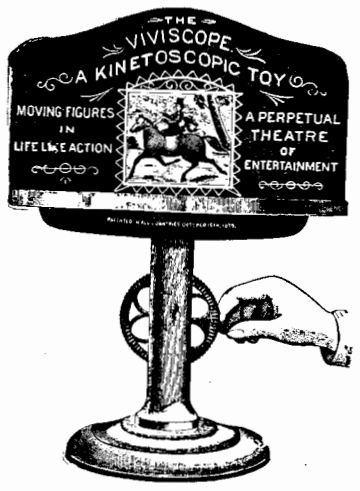

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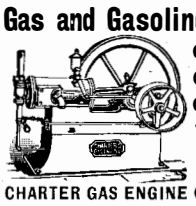

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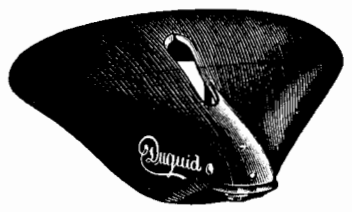

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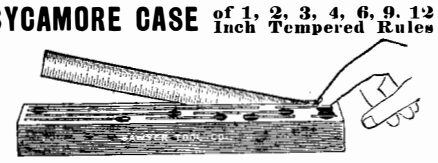

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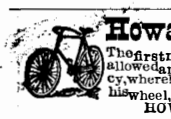

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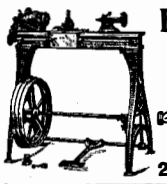

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